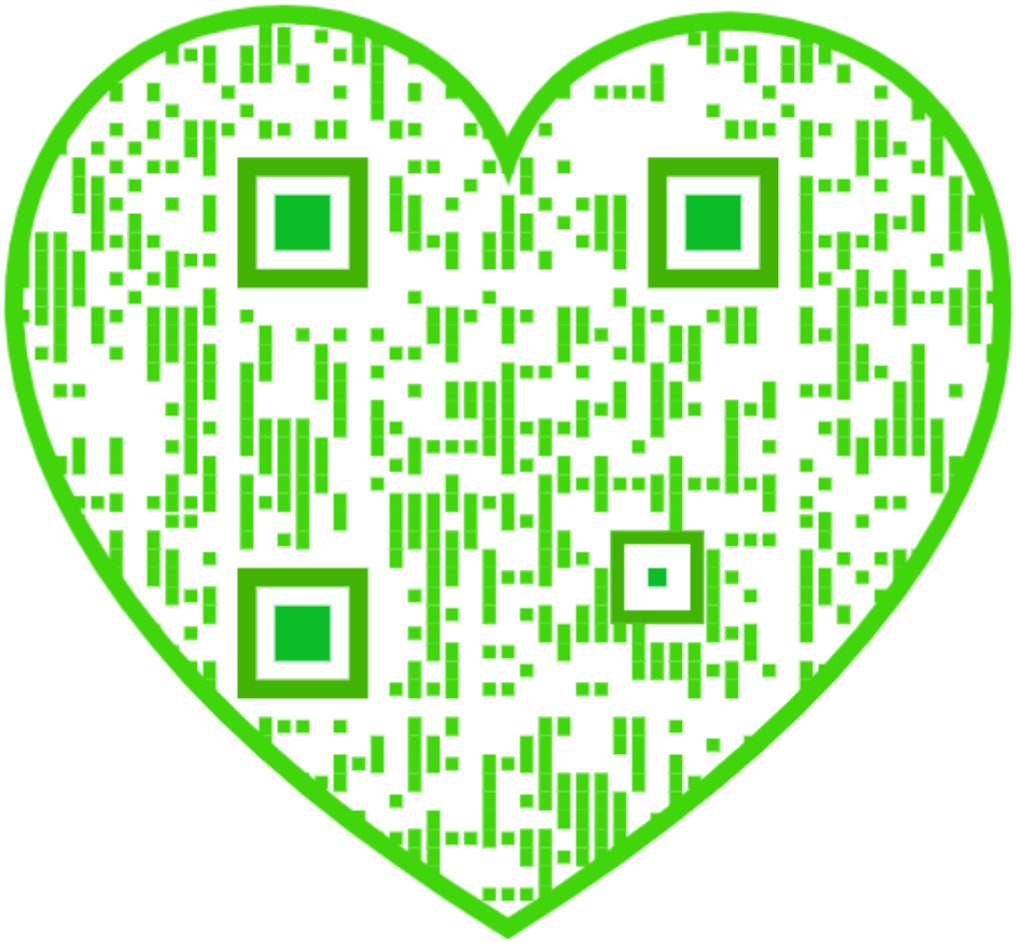

Robert Grieve

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BEES:

THEIR NATURAL HISTORY

AND

GENERAL MANAGEMENT:

COMPRISING

A FULL AND EXPERIMENTAL EXAMINATION OF

THE VARIOUS SYSTEMS OF NATIVE AND FOREIGN APIARIANS;

WITH AN ANALYTICAL EXPOSITION

OF THE ERRORS OF THE THEORY OF HUBER;

CONTAINING, ALSO, THE

LATEST DISCOVERIES & IMPROVEMENTS

IN

EVERY DEPARTMENT OF THE APIARY,

WITH A

DESCRIPTION OF THE MOST APPROVED HIVES NOW IN USE.

BY

ROBERT HUISH, F.Z.S.

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Pluris est oculatus testis unus quam auriti decem.

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INTRODUCTION.

If we take a retrospective view of the apiarian knowledge of the ancients as far back as Democritus, who lived four hundred and sixty years before Christ, we shall find that they directed their attention more to the natural history of the bee than to its economy. The major part, however, of their writings is lost, and the traces of them are only to be found in two works of the seventeenth century, one of which is entitled, "The Portrait of the Honey Fly, its Virtues, Form, and Instructions how to reap Advantage from them," printed in 1646. The other was printed in Antwerp in 1649, and entitled, "The Spring of the Honey Fly, divided into two parts, in which will be found a curious, true, and new History of the admirable and natural Conduct of the Bee, drawn solely from the Hand of Experience." The author of the first of these works is Alexander de Montfort, captain in the service of his imperial and catholic majesty, and who was born in the county of Luxemburg.

De Montfort estimates the number of authors who have written on bees before his time, at between five

and six hundred; and he quotes a few, such as Galen, Aristeus, Aristomachus, Menus, Misald, Philistrius, Solin, John of Lebanon, &c. &c., whose works, however, on that subject are wholly unknown to us. He, however, cites a few with whose works we are conversant, viz. Aristotle, Columella, Varro, Moufet *, Aldrovandus †, &c. &c.

The writings of De Montfort are so far valuable, that they unite the romantic reveries of the ancients with some weak scintillations of modern knowledge. Some of the ancients imagined that the bees were bred from the purest juice which could be extracted from the flowers in summer; others conceived that they were bred from putrid animals, an opinion entertained by Virgil in his Georgics. They were acquainted with the existence of one superior bee, whom they called the king, and who was supposed to originate from a flower or an animal more distinguished and noble than that from which the common bees originated. They regarded the drones or males as lazy, idle flies, of no particular use, and in some degree actually noxious, and only fit to be exterminated. They called them hornets, or *flies of an ugly shape*. When they saw two queens in a swarm, they believed that one of them was

* Thomas Moufet, an English physician, who died about 1600, known by a work written in Latin, entitled, "THEATRUM INSECTORUM." Londini, 1634, in fol. with plates.

† A celebrated professor of physic at Bologna, one of the many authors whose researches into natural history have been most extensive. His works amount to thirty volumes in folio. They, however, did not enrich him, for he died blind in the hospital at Bologna at the age of eighty.

a false king or a tyrant; they therefore called him the *usurping prince who plays on the flute to divert the bees;* all due homage was, however, paid to him.

At the close of the seventeenth century, three celebrated naturalists appeared. Swammerdam, a Dutch physician, Maraldi, an astronomer, and Ferchault de Reaumur, members of the Academy of Sciences, who, by their researches and dissections, began to uplift the veil which had hitherto concealed from us the most important and interesting features of the natural history of the bee. They discovered that there were males and females amongst the bees, and from that period, the theory of De Montfort was admitted to be founded on truth.

Amongst those who in later times have written on bees, may be distinguished principally Schirach, who discovered that the bees who have lost their queen can raise another for themselves from larvæ of their own kind, by imparting to them a peculiar kind of nourishment. (2) Riems, who discovered that there are common bees, which lay eggs. (3) De Braw, who attempted to establish by experiments and specious arguments, that the eggs laid by the queen are fecundated by the drone in the manner of fish; and lastly, Butler, who attributed to the bees a knowledge of the art of solfaing.

This may be considered as the second epoch of the natural history of the bee.

At the close of the eighteenth century, Mr. Huber, a blind naturalist, appeared, who directed his servant, or his servant directed him in those researches, for the supposed verity of which a surreptitious fame has been

awarded him, and which has placed him on the pinnacle of apiarian science, an eminence on which he has been undeservedly elevated by a host of commentators, encyclopedists, editors, and compilers, who have been led away by the apparent originality of his pretended discoveries; but who never deemed it necessary to devote any portion of their time or ability in the investigation of the principles of that theory, of the truth of which they expressed their unqualified assent. If, in the course of the ensuing work, we may have laid ourselves open to the charge of having applied the lash of ridicule too severely upon this falsely celebrated naturalist, we can only answer, in extenuation of that transgression, that we have been encouraged to the commission of it by the thorough conviction, arising from an experience of above forty years, that the majority of the vaunted discoveries of Huber are the result of fiction and delusion, founded on obsolete theories and antiquated prejudices. The man who will assert, that from his own evidence he has heard the queen bee speak the French language,—that he has seen the queen bee place herself in such an attitude as to strike the bees motionless,—that he has seen the queen bees for six consecutive nights engaged in a duel,—that he has seen fortifications erected by the bees; we affirm, that the man who will tell us, and call upon us in a dogmatical tone to believe him, that ten hives will warm an apartment, and twelve a green-house if the bees be well shaken,—that the queen bee is sometimes afflicted with the ague,—that he has seen a bee construct a cell from the foundation to the coping, with numerous other similar

fooleries, possesses but a very slight claim indeed to the character of a profound or accurate naturalist. We are bold enough to declare, that the discoveries of Huber are not only improbable, but even *impossible*; and it is on the basis of that knowledge that we have so unequivocally expressed our dissent to the principal points of the theory of Huber. We have, however, fearlessly thrown down the gauntlet to the advocates of Huber, and although we may stand single-handed in the contest, we fight under the banners of truth, and as such we despair not of the victory.

If an individual, with the view of acquiring some knowledge of the natural history of the bee, or of its management, consult the works published by the "Society for the Diffusion of Useful Knowledge," the "Naturalist's Library," the works of Bagster, Bevan, or any of the periodicals which casually treat upon the subject, will he not rise from the study of them with his mind surcharged with falsities and mystification? Will he not discover throughout the whole of them a servile acquiescence in the opinions and discoveries of one man, however at variance those opinions and discoveries may be with truth or probability; and if he enter upon the discussion with his mind free from prejudice, will he not experience that an outrage has been committed upon his reason, in calling upon him to give his assent to positions and principles, which at best are merely assumed, but to which he is called upon dogmatically to subscribe his acquiescence as the indubitable results of experience, skill, and ability? Huber may have attempted to amuse and astonish

the inexperienced apiarian with the miraculous rearing of a queen bee in a glass cell, and he may have thrown over his description of it all the varnish of direct experimental knowledge; but the editors of the works above alluded to, instead of disgracing their pages by the admission of such a visionary tale, should boldly and indignantly have declared, that from their own experience in the natural economy of the insect, they were able to pronounce the circumstances as related by Huber to be directly *impossible*, and the whole of them based on fiction and imposition.

If we examine the account which Huber gives of his invention of the royal jelly, the existence and efficacy of which are fully acquiesced in by the aforesaid editors, to what other conclusions are we necessarily driven, than that they are the dupes of a visionary enthusiast, whose greatest merit consists in his inventive powers, no matter how destitute those powers may be of all affinity with truth or probability? Before, however, those editors bestowed their unqualified assent on the existence of this royal jelly, did they stop to put to themselves the following questions?—By what kind of bee is it made? Whence is it procured? Is it a natural or an elaborated substance? If natural, from what source is it derived? If elaborated, in what stomach of the bee is it to be found? How is it administered? What are its constituent principles? Is its existence optional or definite? Whence does it derive its miraculous power of converting a common egg into a royal one?—Will any of the aforesaid editors publicly answer these questions? and ought they not to

have been able to answer them, before they so unequivocally expressed their belief in its existence, its powers and administration? Huber declares that he has procured some globules of this royal jelly, and that he administered it *à la façon des abeilles;* the aforesaid editors have believed him, and on his authority alone are the existence and powers of the jelly admitted into the natural history of the bee.

In the prosecution of the interesting inquiry relative to the fecundation of the queen bee, we may perhaps be accused of having committed some slight offence against the rules of decency, and we acknowledge that the portion of the work which treats of that particular subject, was objected to by one of the most eminent publishers of the present day, as not being exactly suitable for the female eye. With every disposition, however, to accede to the opinion of that highly experienced individual, we cannot refrain from asking, why the same latitude should not be granted to us, which has been awarded to others? In every contested point relative to the fecundation of an animal, and in no one is that point involved in deeper mystery than in the queen bee, we do not see how it is possible to steer wholly clear of those expressions, illustrative of the subject, which under any other circumstances would be considered as offensive to decency. How, may we ask, was it possible for us to examine or refute the theory of Huber, or of any other naturalist relative to the disputed point of the fecundation of the queen bee, were we, from a fastidious notion of delicacy, to be debarred the use of that language by which our

ideas could be expressed on the subject. Let it also be considered, that it is a subject on which the female pen has been engaged, even to the most minute investigation of the anatomy of the insect, and surely that which was permissible in a female writer, may be allowed in one of the opposite sex.

In regard to the work now offered to the public, our aim has been chiefly to expose the fallacies and contradictions of the Huberian system, to simplify the mechanical operations of the apiary, and thereby to stimulate those who are already engaged in the culture of the bee to greater exertions, and induce others to undertake it, from a full exposition of the great advantages to be derived from it, not only in an individual, but in a national point of view, and finally, to render this country independent of all foreign supply of the produce of the bee.

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* This should properly have been called Chapter IV., but by some oversight in the figuring of the Chapters, all after Chapter III. have been erroneously numbered.

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The Bee is the most active and industrious of all insects, and it is to its labour that we are indebted for the honey and wax, which form not only an important branch of our rural economy, but are very valuable articles of our import trade. The order, which predominates in the different avocations of the honey bees,—their mode of government—their indefatigable industry—the exquisite skill displayed by them in the construction of their works, and the acknowledged utility of their labours, have attracted towards them the attention of both ancient and modern philosophers, some of whom have employed the greater part of their life in the study and contemplation of their nature and mysteries. Some individuals, however, allowing themselves to be led away by the seductive power of enthusiasm, have endowed the common bees with the faculty of performing the most extraordinary miracles, and amongst that class, Huber certainly holds the most prominent rank. In the dark and unenlightened age, in which Butler wrote his FEMALE MONARCHY, science had made but few and very slow advances on the road to truth ; —the faint glimmer of its light was seen breaking through the dark clouds of despotism and superstition, and shining to future ages as the harbinger of a glorious day :—we are, therefore, disposed to look upon the works of the writers of those days, with the eye of lenity and indulgence; but when in the enlightened era of the nineteenth century, we meet with individuals, who, having the fountains of knowledge, science, and research flowing profusely around them, and to whom the road is distinctly and clearly pointed out, by which they can confirm or refute the results of that research, by means of personal observation and experience : we repeat it, that when we meet with individuals, who, under such favourable circumstances, can still allow themselves to be led away by spurious and fallacious authorities, and thereby

becoming the reprehensible promulgators of a series of errors and absurdities, at variance with all the results of positive experience, and, consequently, committing an irreparable injury to the cause of science, we confess that we feel disposed to treat such individuals with mere derision and ridicule. The skill of the bees in music, and particularly in solfaing, as advanced by Butler, may have obtained credence in the unenlightened age in which he lived, but where is the individual of the present day, gifted with even common understanding, who would not reject a notion so preposterous and absurd, and treat it as the wild effervescence of a visionary brain? And yet, strange to say, the powers with which Huber invests his bees, extend to a far greater diversity of miraculous operations, and are deeper involved in absurdity and fallacy, than the wildest extravagances of Columella or of Butler. The erection of fortifications—the administration of the royal jelly—the art of colouring the combs—the warming of apartments and green-houses by the heat of hives—the faculty of the queen to strike the bees motionless, and the murderous duels of the queens, form, indeed, but a small portion of the miraculous discoveries of Huber, and for which such a spurious fame has been awarded to him.

Of all the early naturalists, the system of Schirach, in regard to the natural history of the bee, deserves the most particular notice, as, in reality, it differs very little from that which is acknowledged at the present day, with the exception of the different kinds of bees invented by Huber, and on the admission of which depend the truth and validity of his system. It will, however, be seen on analyzing the following system of Schirach, that Huber himself, is but an echoist of that naturalist, as they agree in many of the fundamental points, although they differ widely in the minutiæ.

Schirach considered the hive to consist of three kinds of bees, (1) the queen—(2) the drones, being the males—and (3) an intermediate sex, the working bees, to whom he

awarded a greater affinity to the female than the male sex ; but who, nevertheless, were held to be destitute of any procreating power, nor possessing any direct influence on the multiplication of their species. On this classification he founded the following system :—From every egg that would produce a working bee, if it remained in the small cell till its maturity, and being nourished in the usual manner, a queen bee would always result therefrom, if the bees gave to each egg an enlargement of the cell, in which the worm and the nymph could properly expand themselves : and also if the bees provided it with richer food, and in a more abundant quantity. It was also a leading feature of his system, that the parts which belonged to the queen bee, lay concealed in exquisite minuteness, in the liquid principle of the egg, but that as soon as those parts obtained the necessary space for their expansion, they increased in size, and the development gradually proceeded, until the queen attained her full size and beauty. Finally, he affirmed that all the common bees were females and virgins, devoted to perpetual celibacy : and, although possessing in themselves the power of procreating, yet that it was never allowed to be called into action.

The following, therefore, may be taken as the programme of his system ;—

1 The Queen.

2 Drones. 3 Working Bees.

a Fruitful. b Unfruitful.

Drones.

This system, however, met with very great and just opposition, for the very circumstance of the existence of a fruitful ovarium, never procreating, nor producing any of the species natural to it, threw the whole system into disrepute, and at once established its fallacy. Nevertheless, it excited a considerable sensation amongst the entomologists of the day, and some of the opponents of Schirach extended their

dissent so far, as to assert, that all the working bees possessed the power of procreation; and in corroboration of their hypothesis, they appealed to the alleged fact, that hives destitute of their queen, will continue the process of breeding, and even produce a brood of drones. It was, however, a part of the theory of Schirach, that the drones were not an individual species, but that they originated from some spurious or corrupted eggs, or in other words, that they were natural abortions.

In order, however, to consider the history of the bee in its most essential relations, there are certain premises which must be laid down as the basis of that history, although we are well aware that some apiarians, particularly of the Huberian school, will not admit of their validity, and, in fact, it must be allowed, that it is that very contrariety of opinion, which subsists in regard to the natural history of the bee, enveloped, as it is, in almost impenetrable mystery, that renders the attainment of truth so difficult.

It must, in the first place, be conceded, that the queen bee lays every egg in the hive: she is, in fact, the only female, although Huber, Jurine, Humel, Forlani, with a few English apiarians, as their adherents, have revived the obsolete idea, that the working bees are themselves females, although not perfectly formed. Such, indeed, was the opinion of the early German apiarians, who characterized the common bees as *unvollkommene Weibchen* (imperfect little females or mothers), and some indistinct procreating power was given to them, but, at the same time, it was so extravagant and confused, that the generic character of the insect could not be accurately ascertained. The general notions of the German apiarians, respecting the natural history of the bee, were altogether indefinite and paradoxical; and it is universally allowed, that even those individuals, who were appointed by several of the reigning princes of Germany, to superintend their apiaries, or bee-gardens, were as grossly

ignorant of the subject on which they presumed to teach, as the individuals whom they were appointed to instruct*. The majority of them were of opinion, that each species in the hive generated their like ; and from this wild hypothesis arose the discovery of Bonner (subsequently promulgated), of the existence of *little drones,* which he affirms to have discovered amongst the common bees, and to which he awarded the procreating power of the male. It must, nevertheless, be confessed, that the merit is due to the German apiarians, of having been the foremost to eradicate many of the ridiculous prejudices, which had crept into the natural history of the bee, and that it is on the basis of their experimental discoveries, that the different theories of the English apiarians have been erected.

We will not hesitate to declare it as our most decided opinion, that the common bees take no share whatever in the procreation of their species ; although they may, by their reciprocal heat contribute greatly to the nourishment of the brood. Huber, however, in the plenitude of his inventive powers, not only establishes the gender of the common bee, but he has even bestowed upon it an ovarium, and on that point we are decidedly at issue. If the common bees be females, according to the hypothesis of Huber, it ought to be considered as an essential point in the natural history of the insect, to ascertain in what manner those pretended females assist in the propagation of their species? If nature

* Bushman, the superintendent of the apiaries in the imperial gardens of Vienna, was, in the year 1830, so ignorant of the proper management of the bee, that, acting upon the system of Huber, he instructed his attendants to kill the greater portion of the drones, immediately on their appearance, on the principle that as one drone was sufficient for the fecundation of the queen, the massacre of the remainder was an act of prudence and good management, by ridding the hive of a number of superfluous mouths, who were feeding at the expense of the community. The consequence of this gross mismanagement was the loss of three fourths of the hives, which, as is generally the case, was attributed to some malignant influence, and not to the blundering ignorance of the practitioner.

has endowed the common bee with an ovarium, in which no egg was ever discovered, nor which was ever known to be fructified by any sexual coition, the question then naturally presents itself, for what purpose was this ovarium given to the bee? We, however, deny in the most unequivocal manner, that any ovarium exists in the common bee; for, after the most minute and frequently repeated anatomical experiments, we never could discover the slightest indication of such an organ—nor is it consistent with the universal operations of nature, that an organ should be given to an insect, which is not necessary for its support, and the positive use of which is at variance with its individual nature. If Huber, in the support of his theory, could have adduced a single instance, in which the common bee exercised the power of procreation—if he could have furnished us with one indubitable proof of an egg ever having been discovered in the ovarium of the common bee—if he could so far have extended his anatomical researches, as to have discovered a generating organ in the common bee—we would have hailed his discoveries as most valuable adjuncts to the natural history of the insect. We are, indeed, fully inclined to admit that the existence of a neuter in animal life, partakes of the character of a direct phenomenon, and that it requires proofs to substantiate its existence, amounting in force to a mathematical demonstration, before the mind can be induced to admit the anomaly; nevertheless, we are authorized, after the most extended anatomical researches and a series of the most difficult experiments, to denominate the common bee a decided neuter, or in other words, wholly destitute of any organic power of propagating its species.

In the investigation of this important part of the natural history of the bee, the existence of the different species of bees in a hive, ought to be fully established and admitted by all parties as the basis of the inquiry, but even on this head, the most conflicting opinions are maintained. We are

informed by Huber, that, independently of the drones, there are *imprimis*, WORKING BEES, which are divided into two important classes, viz. NURSE BEES and WAX WORKERS; but the most extraordinary and marvellous feature in the nature of the latter is, that although they make the combs, still they make no wax—a contradiction, which it would puzzle Huber himself, and all his adherents, with Mr. Rennie at their head, to solve satisfactorily. It has the same relation with truth, as if he had informed us, that although the silkworm spins its cocoon, still it makes no silk. These working bees, however, according to Huber, may be considered in the character of masons or bricklayers, to whom the materials for the construction of their works are brought by other labourers. We shall, however, have occasion to enter more fully into this subject, when we come to treat of the construction of the combs.

Consistently with the authority of Huber, we are further taught to believe that the entire race of workers are females, and that these procreating workers lay none but male eggs. Here we are admitted to a new insight into the natural history of the bee; for, according to this system, we have twelve or fifteen thousand females in a hive, all laying male eggs, although Huber designedly forgets, at the same time, to inform us, what is the real produce of those eggs, or in what manner they are fecundated. He, however, does inform us that these procreating workers possess ovaries, and that in their nature, they resemble the queens, whose fecundation has been retarded. The result of this system, therefore, is as follows;—In the first place, we have a female insect, self-fecundated, or what is still more preposterous and unnatural, fecundated by an exterior principle, emanating from a female itself!! a female fecundating a female!!! Is it not to be deplored that a doctrine of this kind should meet with any advocates in the present enlightened state of human knowledge?

In the second place, these female workers lay eggs, from which some kind of a male originates, which male, however, has never been seen nor ever known of in the hive. Thus we have paradox upon paradox, irreconcileable with common sense, and which must naturally expose the author of them to the severest criticism.

It is curious to observe the manner in which Huber accounts for the absence of the procreating power of the common bee, and certainly his inventive faculty must have been nearly exhausted, when he ventured upon the following definition of it. Having, in his opinion, undeniably established the fact of the common bee being a female, the next thing which he had to do, was to account for the destruction of its procreating power; for, certainly, the circumstance of the existence of 12 or 15000 females in a hive, and all of them sterile, required some explanation from an individual, who had penetrated so deeply, and with such eminent success, into their natural history. Huber, therefore, very properly proceeds to inform us, that at the time of the deposition of the egg by the queen, from which a working bee was to spring, it possessed all the inherent principles of the female sex; but that on account of the contracted state of the cell in which it was deposited, the larva underwent such a degree of acute pain, that the productive organs were destroyed, and, consequently, that on the bee emerging from the cell, it was neither a male nor a female, but a species of nondescript creature, not belonging to any class whatever hitherto laid down by the physiologists. This may appear very plausible, and no doubt, highly satisfactory to the admirers of Huber, but then how is the contradiction to be solved into which he subsequently falls, in which he states, that some of the workers have ovaries, in which male eggs have been discovered, from which we are authorized to infer, that all the larvæ do not experience such an extreme of pain as to destroy their productive organs? It would appear, how-

ever, that that inference on our part is rather gratuitous, for Huber subsequently informs us that those workers, who have retained their productive organs, must have had a greater quantity of succulent food administered to them, which acted as a balsam to the pain, and enabled the bee to spring into life, with all its natural powers in full strength and vigour.

It is, however, but just to give Huber the full benefit of his discoveries; although we shall distinctly show that the further he proceeds, the deeper he involves himself in contradiction and inconsistency. According to his accurate observation, which with many it is heresy to dispute, all the working bees possess ovaries, but all the ovaries do not contain eggs. It was necessary, therefore, that he should tax his ingenuity, in order to devise some means or principle, by which eggs may be generated in some of these ovaries, and not in others; for he distinctly perceived, great as his reliance might be on the credulity of his readers, that if he gave to every worker an ovarium with eggs, the absurdity of the system would be so manifest, that the whole of it would fall to pieces at once. He has, therefore, recourse to the all-powerful panacea of a peculiar liquid, designated by him ROYAL JELLY *; and we are consequently informed, that if the worms of the workers be favoured with a small modicum of the jelly, its efficacy is so astounding, that the ovarium becomes instantly capable of generating eggs: which eggs, however, produce nothing but males, but of the manner of their fecundation, Huber very modestly and properly acknowledges his ignorance. Still, however, in one ovarium

* By the French apiarians, this truly wonderful and efficacious liquid is called BOUILLIE ROYALE; considering, however, that it is administered solely in the manufacture of queens, we opined, that ROYAL JELLY would be far more becoming and respectful than ROYAL BROTH; although, after all, the French apiarians may perhaps be in the right, knowing, most probably, the ingredients of which it is made, but of which we most candidly confess our entire ignorance.

he found eleven eggs, and in another four—but in what cells those eggs were laid, or what might be the destination of their produce, we are left to the benefit of our own conclusions. It is, however, evident from Huber's own showing, that it is only under certain conditions and circumstances, that eggs are generated in the ovarium of the common bee, or in other words, that it is rendered capable of generating them; which conditions and circumstances, however, are not the result of any determined or fixed natural habit or principle of the insect itself, but the entire phenomenon is to be ascribed to the mere accident of a certain modicum of royal jelly being dropped upon them in the state of larvæ. Thus, the existence of these ovi-positing workers is not indispensable to a hive, for, if they be the offspring of mere accident, it is a proof that the machinery of the hive would work equally well without them, and consequently, that they can only be looked upon as one of the wild freaks of nature, in which she appears sometimes to delight.

It is acknowledged by all apiarians, and confirmed by Huber himself, that it is the queen only, who lays those eggs in the hive from which proceed the queen, the drones, and the common bees; and, had he contented himself with that information, the merit would have been awarded to him of having adhered to the tests of experience; but, he proceeds to inform us, that it is only the female workers, who lay male eggs, from which we are entitled to draw the inference, that the queen, according to his own showing, does not lay all the eggs in the hive, and consequently, that he was decidedly in error, when he says that both the queen and the female workers lay male eggs. In order, however, to be consistent, and to have given his system one single solid foot to stand upon, Huber should have informed us of the exact issue of these male eggs, for he, surely, could not have meant to impose upon us with the fiction, that these eggs produce male bees, which copulate with the female workers; for, some-

thing of that kind must take place, seeing that the creation of some thousands of males in a hive cannot be designed by nature without apportioning to them some particular functions; nor is it less strange that the produce of these eggs should be restricted to the masculine gender, leaving the queen to produce the female eggs and another kind of male (the drones), which she, for some particular reason, monopolizes to herself. Are these fertile workers, (for Huber is silent on the subject) at the same time, virgins and mothers? Do they, in imitation of their queen, retire with their paramours to the woods, or the upper regions of the air, for the purpose of being fecundated? for in no part of Huber's works do we find that he makes the slightest mention of the manner in which these eggs are fecundated, nor of the kind of cell in which they are bred, nor of the precise functions or destination of their issue. The whole is, in fact, a farrago of paradox, inconsistency, and contradiction; but, nevertheless, it is received, on the authority of Huber, into the natural history of the bee, as an indisputable fact.

In defence of Huber it must be acknowledged that Mademoiselle Jurine determines the common bees to be *imperfect females*, for which discovery she is highly extolled by Mr. Rennie, late Professor of Natural History of King's College, London. In despite, however, of the eulogium of the worthy professor, we will venture to affirm, that the theory of Mademoiselle Jurine is of a very antiquated date, and promulgated a few hundred years before Mademoiselle took upon herself the arduous task of the anatomy of the bee: she has, however, like her great prototype, forgotten to inform us in what particular relations of the bee that imperfection lies. Taking, however, Huber and Jurine as our authorities, we consider that it lies in the existence of an ovarium of no utility whatever, in which no eggs were ever found or ever known to exist, unless expanded by the accidental administration of a modicum of royal jelly; but nevertheless,

that eggs are still deposited, *unfecundated,* from which, however, springs a kind of male, *which has never been seen,* and the uses of which are wrapt in an insoluble mystery. Thus is the imperfection of Huber and Jurine satisfactorily accounted for.

Having thus expounded the theory of Huber and Mademoiselle Jurine respecting the common bee, we will notice the extraordinary discovery of M. Epignes, a member of the Linnean Society of Bourdeaux, who in a volume of their Transactions, has published his researches into the natural history of the bee, and therein has decided the point, according to his own opinion, beyond the power of refutation, *that the common bee is a decided male.* Mons. Epignes, however, possesses sufficient candour to confess, that in the confirmation of this disputed point, he sees himself environed by difficulties, from which he cannot extricate himself. The existence of ten or twelve thousand males in a hive, without any female to procreate their species, appears to him to be in such direct opposition to the established laws and operations of nature, that he cannot be induced to admit it, without committing an actual violation upon his reason. Not so with Huber, however, for he bounds over those difficulties with the agility of a chamois over the rocks of his native mountains, and for which reason, he often tumbles into a quagmire, from which neither he, nor his adherents, can possibly extricate him. On a general principle, however, there is very little difference between 10,000 females without a male, according to Huber, or 10,000 males without a female, according to M. Epignes; there exists, however, an essential difference between the females of Huber, and the males of M. Epignes. The former procreate, although their issue has never been known; whereas the latter do not procreate at all, having no female with whom to associate. Without, however, attaching our assent in the slightest degree to the hypothesis of M. Epignes, we may venture

to ask, what now becomes of the highly vaunted anatomical researches of Mademoiselle Jurine, whose opinion on the sexual character of the common bee is so warmly espoused by the editor of the Insect Architecture, published by the Society for the Diffusion of Useful Knowledge? Is it possible, we may ask, that the ovaries of Huber could have escaped the investigation of M. Epignes, if any such ovaries had been actually in existence? An organ of that kind, so necessary and indispensable to a female insect, must, at once, have been so apparent, as to have excited the immediate notice of the anatomist; no such organ, however, having presented itself to the observation of M. Epignes, he considers himself authorized to deny its existence *in toto*. Thus, it is most curious to remark, that nearly in the middle of the nineteenth century, notwithstanding the most minute and extended researches by men of the profoundest talent of all ages and of all countries, the sexual character of the common bee remains still a disputed point, and its real nature, but imperfectly understood.

In the organization of the common bees, there are three essential characters, which demand our notice. The first is the head, the second, the middle of the body, and the third, the belly or the abdomen.

In the head are two sets of jaws, which open and close laterally, and it is by this organ that it is enabled to collect the farina of the plants, to form it into wax, to construct the combs with it—and to carry to or from the hive whatever is necessary or detrimental to it. On a further examination of the head, a proboscis is perceptible, highly flexible, which the insect puts forth and draws in at pleasure, and it is by means of this organ that the bees collect the honey from the flowers, and imbibe their own nourishment.

In the middle of the body are the breast and the two stomachs, the common bee having always two, one as the receptacle of the honey, and the other in which the wax is

elaborated. Each insect has four wings, two larger and two smaller, the latter being nearest to the head. It has six feet, on the two hinder of which are two triangular cavities, in which the bee by degrees collects the minute particles of the farina from the flowers. According to Huber, the bee in search of the farina, *rolls itself in the cavity of the flowers*, and having secured the treasure, hastens to the hive, and on reaching it, enters one of the cells *head foremost*, takes the pellets from the cavities of the hinder legs, *and which being moistened and mixed with a small portion of honey* are kneaded into a substance, called bee bread, a proper supply of which is necessary to the strength and health of the bees during the winter, and *without which, they would become consumptive and die.*

These statements of Huber are wholly without foundation*. The bee does *not roll itself* in the cavity of the flower; it collects the farina with its forceps or pincers, and having collected a certain quantity, it takes to its wings, hovering over the flower, during which time, by means of the fore and middle legs, it conveys the farina to the cavities of the hinder legs, and then lights upon the flower again to obtain a fresh supply.

The bee in unloading itself does not enter the cell *head foremost*, but directly the reverse. It places its hinder feet in the cell, and with the other feet detaches the pellets from the cavities, and then with its hinder legs kneads the pollen at the bottom of the cell.

The pellets of farina are never moistened nor mixed with any portion of honey whatever. It is deposited in its crude

* It is really deplorable to observe the manner in which these fictions of Huber are introduced into almost all our Encyclopedias, and elementary works on Natural History. Thus, for instance, in Chambers' Edinburgh Journal, we find a Mr. and Mrs. Elwood instructing their children in the Natural History of the Bee, the whole of which instruction, based on the supposed discoveries of Huber, is surcharged with error, and the sole tendency of which is to lead the infant mind astray.

state, as it is gathered, and it has acquired the name of bee bread, on the supposition that it formed a part of the sustenance of the bee, but, so far from its being conducive to the strength and health of the bees during the winter—they will perish, rather than partake of it. In regard to its prevention of consumption, as alleged by Huber, we can positively affirm, that it is a disease unknown to the English bees, however prevalent it may be according to the observation of Huber, amongst the Genevese.

The body of the bee, or the abdominal part is attached to the breast by a kind of thread, and is composed of six scaly rings. The whole body of the bee appears, even to the naked eye, to be covered with a kind of hairy down. Age makes some difference in them, in regard to the colour of the insect; at its egress from the cell, it is of a greyish hue, but the bee that has been the tenant of a hive for a year or two, is of a dark brown, and the extent of its labour is known by the wear and tear of its wings, which appear torn and fringed. On the breast, and at the roots of the wings, are observed small orifices or pores in the shape of a mouth by which the bee respires, and which are technically called *stygmates*. The body is covered with six rings lapping over each other like the scales of a fish. The interior consists of four parts—the intestines—the honey bag—the venom vesicle—and the sting. The intestines, as in other animals, serve for the digestion of the food, and the retention of the fæces. The honey vesicle, when it is full, is of the size of a small pea, and sufficiently transparent to ascertain the colour of the honey which it contains.

The vesicle which contains the venom, is at the root of the sting, the latter is hollow like a tube, and at the time of its infliction, the venom passes down it, and is diffused into the wound. The sting is about two lines in length, and is darted into the skin with great violence, by means of certain muscles, which are placed very near to the sting, and are very

perceptible on squeezing the hinder part of the bee—its extremity is barbed like an arrow, and when examined by a microscope, the whole of the sting appears like a saw with very sharp incisions, which render the extraction of the sting a matter of great difficulty to the bee, in fact, in the generality of cases, the act of withdrawing the sting is fatal to the insect, as from its barbed nature, it cannot be drawn out, without bringing along with it, a portion of the intestines, the consequence of which is, the death of the bee. In all cases, the sting should be extracted as soon as possible, for the longer it remains, the more painful will be the wound, on account of the venom continuing to flow down the hollow of the tube, and thereby increasing the virulence of the pain.

In regard to the remedy for the sting of a bee, many have been prescribed, such as vinegar, urine, laudanum, goulard-water, the juice of certain plants, as the dandelion, dock and others, and oil of olives, which is said to be a remedy even for the bite of a viper. The most simple and efficacious of all remedies, however, is an immediate application of cold spring water. A piece of linen soaked in water, and applied to the wound, will in a very short time assuage the pain, and diminish the inflammation. It must, however, be admitted, that the remedy greatly depends upon the bodily constitution of the individual, and the particular state of his blood; thus, laudanum with some persons, will afford immediate relief, whilst with others, it will be wholly inefficacious*. We have met with some individuals, on whom the venom of the bee appeared to be deprived of its painful qualities; thus, Bonner for instance, seemed to be almost venom-proof; we

* Lombard is of opinion that the more frequently a person is stung, the milder is the pain which he experiences. This must be a great satisfaction to the young apiarian, who can consequently congratulate himself, that, in time he may be enabled to carry on his operations with his bees, without the attendant dread of their stings. Lombard was, however, a fanciful naturalist, and the above was one of the, not least, remarkable of his conceits.

have seen his head, which was very bald, literally studded with stings, and yet no swelling took place, nor were they attended with any pain; but had any other person experienced a twentieth part of those stings, death would most probably have been the result.

The following is a Prussian recipe for the sting of a bee, or any other venomous insect;—Beat an onion on a hard body to extract the juice, to which add a pinch of salt; apply the mixture to the sting, and the pain and inflammation will instantly cease. In regard to this, and other remedies, we can only say, that although they may possess in themselves a certain degree of efficacy, yet the articles of which they are made, are not always within the command of the sufferer; whereas cold water is generally within the immediate reach of every one.

L'Abbé Della Rocca, who resided in the islands of the Grecian Archipelago, as well as in the department of the Seine-et-Oise, in France, affirms that the bees of the latter are much less vicious than those of the former, and which he attributes to the difference of the climate. He mentions two instances in which bees have been made use of as instruments of war; the first was that of a small corsair, which, with a crew of forty or fifty men, and having on board some hives of bees, formed the daring project of boarding a galley with a crew of five hundred men, which was in pursuit of it. The corsair from the bowsprit threw the hives on the deck of the Turkish galley. The Turks, not being able to protect themselves from the stings of the enraged insects, became so alarmed, that they tried every means of sheltering themselves from their fury; the crew of the corsair, however, being provided with gloves and masks, boarded the galley, sword in hand, and obtained possession of the vessel, with scarcely any opposition. The second case was that of Amurath, Emperor of the Turks, who besieged Abba, in Greece, and having made a breach in the walls, found it

defended by bees, the hives of which were placed on the ruins. The Janissaries, although the bravest of the Ottoman troops, were never able to overcome this obstacle.

Pigneron relates that the Spaniards experienced the fury of the bees at the siege of Tanly. When they were preparing to make the assault, the besieged placed a number of hives in the breaches, which attacked the besiegers so furiously that they were obliged to retire.

We are acquainted in England but with one sort of bees, as the fabricators of honey and wax, although the foreign naturalists mention three, one of which is said to be rather numerous in the Archipelago, but they are by no means domesticated, being a kind of marauding vagabonds, who make war upon the produce of the domesticated bees.

The labour of the bees appears to be regulated on the most extraordinary and undeviating principles, and has from the earliest ages excited the attention of the philosopher and naturalist *. An undisturbed harmony—a perfect intelligence and union reign amongst all the bees of the same hive, in whom no want of concert is ever perceptible, nor any disunion, but by accident. If they be attacked by any of the neighbouring bees, or by other insects, they appear to be animated by the same zeal—the same ardour—the same vivacity of spirit, in the common defence of their property and habitation, and will rather sacrifice their lives, than yield the palm of victory to their opponents.

The mutual services which the bees render to each other, and the assistance which they administer to those who stand in need of it, prove incontestibly the great friendship which reigns amongst them. If the bees, who return from the fields be wet, or covered with dust, the insects at the

* Pliny, as well as Mathiolus, relate some marvellous things in the economy of the bees, and the philosopher Aristomachus employed sixty years in the study of them. They however baffled him, as they have done every subsequent naturalist, who has attempted to wrest their secrets from them.

entrance of the hive proceed to dry and clean them, before they be permitted to enter the hive. If they be in want of food, it is pleasing to behold with what solicitude they administer to the wants of their famished companions, projecting their proboscis towards them, on which the globule of honey is distinctly perceptible.

The regular distribution of labour amongst the bees is a circumstance so very surprising, that it would scarcely be credited, except by those who have bestowed the most minute attention upon their actions. Some of them perform the duty of sentinels at the entrance, preventing the ingress of all strangers and enemies; others are employed in traversing the fields in search of their winter stores, or collecting the materials wherewith to construct their combs; whilst others employ themselves at home in the erection of their cells, according to the most correct geometrical proportions, and with a skill, which far exceeds the utmost extent of human ingenuity.

"Labor omnibus unus,
Mane ruunt portis, nusquam mora."

Huber has discovered that a certain number of bees are regularly appointed as the body-guard of the queen, following her in her travels through her dominions, and assisting her majesty in any predicament into which she may have fallen. They have also a supply of provisions always ready at hand, to administer to her majesty, should she be hungry; but on the other hand, these guards, according to Huber, behave sometimes in a most impudent manner to their royal mistress, such as would not be tolerated in any other monarchy, than that of the bees. We will, however, leave this discovery to the consideration of those, who have sufficient credulity to believe in it, but for ourselves, we treat it as an absurd and ridiculous fiction.

The most incessant labour appears to be the leading principle of action of the bees; from the first glimpse of light to

almost total darkness, they are to be seen scouring the country in all directions, extending their flight sometimes to the distance of three or four miles, and returning not, until their vesicle be filled with honey. As these incomparable insects entertain a decided aversion from all filth and uncleanliness, it is impossible to witness a structure more beautifully clean and neat, than is exhibited by the interior of a hive. Nothing that has the slightest approach to infection is allowed to remain in it; every dead bee is immediately carried out of it, and the abortive brood is torn from the cells and instantly removed from the hive. There is scarcely any insect which has more enemies than the bee, and they are generally of the most cunning and insidious character, stealing into the hive under the coverture of darkness, when they carry on their depredations without the fear of detection. In regard to the snail and the mouse, the bees often display a degree of sagacity which is truly wonderful in so small an insect. A mouse stands a poor chance against half a dozen bees; but having killed him, their united strength is not able to drag him out of the hive, but rather than endure the annoyance of his putrifying body, they will cover it with a coat of wax, which completely prevents all effluvia from ascending to the combs.

The bee must not be considered as an offensive insect, but almost universally acting upon the defensive. It is true that it possesses the sagacity of discovering a weak hive, and will attempt to pillage the property of its neighbours; but the very manner in which it goes about the business, shows that it is perfectly aware that it is committing an act of injustice. A pillaging bee, bold and resolute as he may show himself in the defence of his own property, generally shows himself a coward when he goes forth on a marauding expedition. It must, however, be observed, that in proportion as the weakness of a hive increases, so does also the spirit diminish with which the bee is naturally prone to

defend his property, and an attacking bee has therefore the greater chance of succeeding in his design.

Eager as we are in our inquiries after truth in everything appertaining to the bee, we cannot refrain from admitting into our pages, the following singular statements of Mr. Duncan. Speaking of the labours of the bee, he says, "their labours appear unceasing, yet do the weary labourers sometimes snatch an interval of repose: during the busy season, we *have seen hundreds of the workers retiring into their cells and exhibiting all the marks of profound sleep;* this fact is very easily observable, especially in those cells which are constructed, as sometimes, against the glass, and when that substance forms one side of the cell. *There they are, the fatigued labourers stretched at full length with their heads at the bottom, and every limb apparently in a relaxed state, while the little body is seen heaving gently from the process of respiration;*" and could Mr. Duncan suppose for a moment that he could succeed in imposing such an extraordinary fiction as the actual truth upon his readers, that the bees enter the cells for the purpose of taking a nap? We know that there are only two purposes for which the bee enters a cell, and the most probable reason of the hundreds entering the cells, as witnessed by Mr. Duncan, was for the purpose of disgorging the honey which they had collected in the fields, but even Huber in the most extravagant of his apiarian visions never ventured so far as to make his bees go to sleep. "*There they are,*" says Mr. Duncan, "*stretched at full length with their heads at the bottom,*" and when, we will presume to ask Mr. Duncan, did he ever behold a bee, stretched at full length with his head at the bottom? The position of the sleeping bees, as described by Duncan, is the natural one of the bees on degurgitating the honey, but as to sleep, no bee ever yet fell asleep in a cell, or out of a cell. The bees will rest from their labours, huddled closely together, but the cells of a hive were never yet applied to the uses of a dormitory, and we will venture to affirm that sleep

is as great a stranger to the eye of the bee, as it is to that of a herring*.

It was one of the crotchets of Huber, that every bee has its appointed department of labour, to which it is by nature confined, and, consequently, that it is not governed by any positive concert of action. Accordingly, he divides the bees into several classes or communities, in the first place, we have *the nurse bees*—secondly, *the wax makers*—thirdly, *the wax workers*—fourthly, *the jelly makers*—and fifthly, those who may be regarded in the household economy of the hive, as bees of all work. Not contented, however, with this classification, on which we shall have occasion to enter further into detail, in a subsequent part of this work, he has discovered other inmates of the hive, which are brought into existence for no other purpose, than to be unceremoniously driven out of the hive, either to be starved to death, or to be killed in dire conflict with the more favoured portion of the community. These truly unfortunate insects, which are only born to be killed, are by Huber styled *black bees*, as they are, however, determined by him to be of no use whatever, he did not waste his valuable time in examining their sexual character, or the origin of their existence. Mr. Rennie, however declares the discovery of these black bees, to be most miraculous, in which we most cordially agree with him, as that which is miraculous, is always contrary to, or beyond the ordinary operations of nature. Kirby supposes these black bees to be toil-worn, superannuated workers, and consequently of no further use to the community. One mo-

* If Mr. Dunean can derive any satisfaction from the knowledge that he does not stand singly amongst the apiarians, in his hypothesis respecting the sleep of bees, we refer him to a work printed at Saragossa in 1621, entitled, *Perfecta y curiosa declaracion de los provechos grandes que dan las colmenas, bene administrados, y alabanças de las abejas; par Jaime Gil, Natural de Magallone. En Saragoza*, 1621.—This author informs us that the bees sleep during the night, and especially on fast days, and he further informs us, that bees cannot possibly thrive without being copiously sprinkled with holy water. The priests are of the same opinion, because it is a source of revenue to them.

ment's reflection, however, or a very limited degree of actual experience, would have taught that entomologist, that the notion of a superannuated worker turning black, and therefore condemned to be killed, is at direct variance with the well known habits of the bee. Huber, however, carries his hypothesis still further than Kirby; for consistently with his experience, they are in themselves a distinct species, having no interest in the general concerns of the hive, and no one having any interest in them.

It is affirmed by Kirby that Thorley confirms the existence of these black bees; but we cannot find any such confirmation in the works of that writer. Thorley merely says, "that in the month of July, you will perceive many bees of a dark colour, with wings rent and torn; but that in September, not one of them is to be seen." Now there are some parts of the foregoing observation, which are perfectly agreeable to experience, for it is well known to every apiarian, that an old resident in the hive, is of a much darker colour, than one that has just emerged from the cell. He has lived, as it were, during the whole of his life, in the hot and dense atmosphere of the hive, and like the combs, which were originally white, but which have assumed a blackish hue, owing to the internal heat of the hive, he exhibits a deeper and blacker hue, than his newly-born brother. In no part, however, of Thorley's work do we find that there are black bees in the hive, which form a distinct species, but such is the affirmation of Huber, and, accordingly, it is given in Kirby's entomology, as an accredited fact in the natural history of the bee.

As one proof, however, of the very gross ignorance of Kirby in the natural history of the bee, he says, "that it appears to be the law of their nature to rid their community of all supernumerary and useless members," and he founds this erroneous opinion upon the annual destruction of the drones. When, however, did Kirby, or any other naturalist ever

witness the massacre of a working bee by the members of its own community, on the ground of its superannuation ? Nothing can be more directly contrary to the general principle of action, which is established amongst them. A bee will kill a stranger bee, who attempts to force his way into the hive; but, it cannot have escaped the observation of every scientific keeper of bees, that there appear to exist, throughout their whole community, an affection and attachment for each other, which are not to be found in any other society of insects.

If Kirby, instead of his conjectures as to the character and ultimate destination of these black bees, had denied their existence *in toto*, or treated them as one of the extravagances of Huber's fancy, he would have given us some reason to suppose, that he was guided by the power of his own experience, when he compiled his history of the bee in his introduction to entomology ; he, however, fully agrees with Huber in their existence, but differs from him in the cause of their destruction. In justice to Kirby it must, however, be stated, that he stands not alone in his opinion, for he is propped up in his hypothesis by the editor of the Insect Architecture, who says, " *that the very great number* of these black bees, which *sometimes* appear, does not well accord with the opinion of Kirby and Spence." Without attempting to disperse the obscurity of this passage, we shall briefly remark, that of the two hypotheses of Huber and Kirby, we should be inclined to give the preference to that of the latter entomologist, for there is something more plausible and less objectionable in the massacre of a few useless, superannuated members of the hive, than that, according to Huber, like the ephemera, they should be born to a mere diurnal existence, endowed with no property of utility, and doomed to be starved to death by the community at large.

In opposition, however, to the experience of the most celebrated apiarians of the present day, native and foreign, Mr.

Duncan persists in his belief of the existence of these black bees, for he says, "we have noticed them, though rarely, perhaps not more than one or two in a season. The other bees did not molest them as far as we observed, nor indeed seemed in any way sensible of their presence." If Mr. Duncan will transmit to us one of these black bees, we will in return send him the best hive of honey in our apiary.

The whole system of Huber, however, in regard to the existence of several species of working bees in the hive, has in reality not the slightest foundation in truth. There are, in fact, but three species in the hive, viz. the queen, the drone, and the working bee. In regard to the latter, there may, indeed, at times, be a slight difference in the size; but this circumstance is satisfactorily accounted for by the particular cell in which a bee is bred. The bee which comes out of a cell, in which no bee has been previously bred, will be larger than the bee, which emanates from a cell in which two or three have been bred before it; and this arises from a slight film, which the young bee leaves behind it on issuing from the cell, which consequently becomes contracted, in proportion to the number of films which have been left in it. It belongs, however, to the crude theory of Huber, not only to have given several distinct natural characters to his bees, but also to have apportioned to them a separate kind of labour, according to the respective species to which they belong. We might have remained satisfied, had he confined himself merely to the latter part of his theory, for it is consistent with probability, that a common bee cannot be a nurse bee, and a wax worker, or a wax maker, and a jelly maker at the same time; on the same principle, that an Irish labourer cannot be a hodman and a bricklayer at the same moment, although, if occasion required, he could perhaps perform either operations with equal ability. It is not, however, in this particular only, that the paradoxes of Huber exhibit themselves in their fullest force, for, in speaking of

the nurse bees, he says, that they are rather smaller than the wax workers, and *when gorged with honey, their belly does not appear, as in others, distended.* Here we have a direct reversion of the law of fluids, for we know it to be an established principle, that in all elastic bodies, the extension or expansion of them is equal to the volume of the fluid received, but in the present case, that principle is completely nullified; for we are gravely informed that a common bee, simply because it is a nurse bee, shall actually gorge itself with honey, so as to fill the vesicle or bladder in which it is contained, but, nevertheless, that such vesicle or bladder shall not, according to the law of fluids, be extended according to the volume of the liquid received. Whereas, on the other hand, if the same quantity of liquid be received into the vesicle of the wax workers, that such vesicle becomes very naturally distended ; and this gross, this glaring, and palpable contradiction has been promulgated and actually acquiesced in, as the positive result of the personal experience of an individual, who must have entertained a most contemptible opinion of the sense and judgment of those, on whom he attempted to impose so great an absurdity. We will, however, put an important question to the adherents of Huber. Is not the nurse bee (granting for a moment that there be such a distinct species) a collector of honey? Does it not range the fields in quest of the mellifluous juices? and on its return, has no distension of its vesicle taken place according to the quantity of honey which it has gathered? Or is the nature of the nurse bee so wonderfully constituted, that its honey bag shall distend under certain circumstances, and not under others? According to our experience, it is this very distension of the body, which is, and always has been considered, as the criterion of the vesicle of the bee being filled with honey. The body then assumes the shape of an elongated cylinder, the division of the rings becomes more fully displayed, and the action of respiration is more violent

and frequent. In order, however, to bolster up this rotten theory, Huber has deemed it necessary, in defiance of the truth, to alter the organic structure of the two kinds of bees, by giving to one a stomach which is capable of distension, and to the other, one which is not, although the same or a greater quantity of liquid be received into it.

There is, however, another and more insoluble difficulty, which the Huberians have to surmount, in support of this part of their theory, which is, at what particular stage of the life of the bee, was that difference in its organic structure imparted to it? Was the principle of that difference inherent in the egg, or did the change in its structure take place after its emerging from the cell? It is but just that the Huberians should solve this knotty question; although, perhaps, they are not aware of the dilemma in which they are involved, by attributing a positive difference of organical structure in an individual species of insect, to which also a different system of action, and a direct diversity of animal functions are attached. It certainly will not be denied by the Huberians, that the principle of the organic structure of either bird or insect *is inherent in the egg* from which it is to spring; if then, according to Huber, there be a difference in the organic structure of the bees, that is, in the nurse bee and the wax worker, the principle of that difference must have existed in the egg, when deposited in the cell by the queen; and here we arrive at one of the gross contradictions of Huber. He admits that the queen lays but three kinds of eggs; that is, the queen eggs, the drone eggs, and the eggs of the common bees; yet, that from the latter originate four or five kinds of insects, differing from each other in their organic structure. Huber saw the difficulty of this dilemma, and in order to escape from it, he informs us, in the full spirit of contradiction, that the queen does not lay all the eggs in the hive, for that he *once* entrapped a common worker depositing its egg, from which he *supposes* that a male bee is to spring.

He even favours us with a drawing of the ovary of the common bee, which is, in reality, nothing more than two small ducts, through which the excremental matter passes, and which possesses not the slightest affinity with the ovarium of the queen. If, however, the principle of the organic structure of the two kinds of bees be not inherent in the egg, Huber must have recourse to another still more untenable theory, namely, that the common bees, amongst other miraculous powers, with which he has invested them, possess also the astonishing faculty of altering their nature by their own individual powers, and contrary to that which they actually received in their embryo state in the egg.

In regard to the senses of the bees, endless has been the controversy respecting them, and whilst almost every naturalist has seen himself obliged to admit the extreme acuteness of the majority of them, yet the actual locality of their organs is a problem that still remains to be solved. Thus the locality of the organ of hearing has never been ascertained, from which Huber and his adherents have considered themselves authorized to deny to the bees altogether the possession of that particular sense; whereas a very limited experience with their natural habits must have confirmed its existence in the most unquestionable manner. In no part, however, of the history of the bee, has Huber fallen into greater inconsistency, than when treating of the existence of the senses, and the locality of their organs. In regard to the non-existence of the sense of hearing, we confess that he has many respectable authorities to support him in his opinion; and although amongst those authorities may be classed the scientific names of Aristotle, Linnæus, Bonner, and others of equal celebrity; yet, on the other hand, Huber ought to have been able from his own experience to have decided the question, affirmatively or negatively, without being obliged to have recourse to the opinion or experience of others. He does, indeed, in a

cursory manner give us the result of his experience, but in the end, he leaves the subject in its original doubt and uncertainty. If, however, we enter upon a close analysis of the opinions and statements of Huber on this particular subject, we find them as usual attended with the grossest contradiction; and yet, amongst all the naturalists, who have ventured upon the discussion of this most difficult department of the history of the bee, there is no one, who ought less to have denied to the bee the sense of hearing, than Huber; for in some very essential points, the actual truth and validity of his system depend upon the existence of that sense, and without it the whole machinery of the hive would be thrown into disorder. The following instances will verify the foregoing remark. According to the repeated experience of Huber, all the young queens, when they are incarcerated in their cells by the rebellious spirit of their subjects, are distinctly heard by Huber to make a clacking or a humming noise, and it puzzled him for a long time (of the truth of which we have not the smallest doubt,) to discover for what intent the queens emitted such a dolorous cry. After suggesting many cases, one perhaps as possible and plausible as the other, he at last alighted upon one, which he thought the most probable of all probable ones, which was, that the queens, from their long imprisonment, wanted something to eat. His grounds for warranting him in forming that conjecture were, that the queens had not emitted the sound beyond the period of a minute, before several bees *were seen* to hasten to the assistance of the young queens, and it was distinctly *visible* to Mr. Huber, that the queens projected their proboscis out of the cell, and were immediately supplied by the bees with the food for which they were craving. Now in the description of this comico-farcical scene, does not Huber clearly admit the sense of hearing to be actually existing in the common bee? for where would be the utility of the queens uttering a particular sound, if the bees were

destitute of the power of hearing it? But Huber unequivocally admits that they *do* hear it, and further, that it is a language which they perfectly understand, the meaning of which was, that the hunger of the clamorous queens was great, and that they called upon their subjects immediately to satisfy it: now if the bees were by nature deaf, as Huber alleges, the queens might have clacked till they fainted, and been in the end literally starved to death.

We will now proceed to adduce another instance. It appears from the *ocular* experience of Huber, that the bees, under particular circumstances, behave in a most rude and indecorous manner to the queen regnant, amounting almost to a treasonable attempt upon her life; one of which circumstances is, when the queen is in her passions so cold and phlegmatic, or so culpably indifferent to the interests of her monarchy, as to refuse to leave the hive for the purpose of being fecundated in the open air by her favourite drone. On such occasions, according to the valuable and accredited discoveries of Huber, the bees become outrageously impudent, following the queen in all directions, and biting and teasing her in the most merciless manner; by which ungracious treatment, the life of the queen would be put in the greatest jeopardy, had not nature kindly provided her with the means of checking their rudeness, by investing her with the power of uttering a particular sound, which when accompanied by a certain attitude, which the queen can assume at pleasure, strikes the bees instantly motionless, and they hang their heads, confounded with the sense of their indecorous behaviour. Now Huber in the above statement positively and unequivocally awards to the bees the sense of hearing; the effect of the sound uttered by the queen is truly astonishing upon them: and yet, notwithstanding the minuteness with which Huber describes these occurrences; notwithstanding the existence of the sense of hearing in the bees is actually indispensable in order to

obtain for these statements of Huber the slightest credibility, he yet hesitates to give to the bees that sense, merely because the locality of its organ cannot be discovered.

We will adduce a third instance, and most reluctantly do we introduce it, as it is a specimen of the grossest absurdity which was ever admitted into the pages of an author, professing from actual experience to elucidate any of the controversial points of natural history. Consistently with the *oracular* experience of Mr. Huber, the vernacular tongue of his queen bees is the French; and he affirms, that when they condescend to speak it, the meaning thereof is distinctly understood by the common bees, which is a direct implication that they do possess the sense of hearing. It was generally affirmed by the early apiarians, that the queens, previously to swarming, were heard to emit a sound resembling, *chip, chip*, which sound, however, was never yet emitted by any queen bee within the British dominions; although many credulous people, acting upon the above-mentioned affirmation, still incline their ear to their hives for the purpose of catching the welcome sound, as it is believed to be an announcement of the departure of a swarm on the following day. We do not, however, hesitate to affirm, that neither the queen bee, nor the common bees, possess the faculty of articulating any particular sound, and after this positive affirmation, in what light must we view the assertion of Huber, founded on his oracular evidence, that he has frequently heard his queen bees exclaim, "*Je suis ici! je suis ici!* I am here! I am here!" and that the said exclamation was no sooner *heard* by the common bees, than they flocked in crowds to ascertain the meaning of the exclamation, and to execute whatever commands her majesty might be pleased to issue?

We have thus adduced three instances, in which Huber asserts, that the bees, *from his own evidence*, did positively hear a particular sound; further, that their actions were immedi-

ately regulated by that sound; and yet after these unqualified admissions, he still ventures to express his doubt, as to the bees being vested with the faculty of hearing. On this subject, however, Huber very justly observes, that it was a matter of great astonishment to him, to hear the queen bees speak the French language; and we may be allowed to add, that our astonishment exceeds that of Huber, that any individual can be found at the present day, who can give the slightest credence to the many absurdities, which he has promulgated relative to the natural history of the bee.

For the purpose, however, of setting at rest the question of the sense of hearing existing in the common bee, and deciding it in the affirmative, let the following experiment be tried. Drive about two or three hundred bees out of the hive into an empty one. Place the back of a chair or a piece of board parallel with the entrance of the hive, and throw a table cloth over it. Shake the bees upon the cloth, and then with the feathered end of a goose-quill, or any other instrument conveniently at hand, guide about half a dozen bees to the entrance of the hive. They will no sooner be sensible of the odour of the hive, than they will set up a loud humming noise, accompanied with the quick tremulous motion of their wings so well known to apiarians, which noise will be no sooner heard by the remaining bees, than they will instantly flock towards the entrance with their customary token of joy, and in less than half a minute not a bee will be seen on the cloth.

In regard to the locality of the organ of hearing, we fear that it will ever remain a disputed point; it has hitherto baffled the researches of the most acute anatomical skill, and the positive existence of the sense is all that can be at present definitely determined.

It has been long a subject of inquiry amongst apiarians, as to the particular sense by which the bee is guided, in directing its course to its distant fields of pasture, and in the

unerring certainty with which it retraces its flight to its hive. It is allowed by all naturalists, that the acuteness of the sense of smell in the bee is greater perhaps than in any other animal, but there are many circumstances which can be adduced, which go to prove that it cannot possibly be the sense of smell which guides the bee in its labours, and, consequently, the conjecture is perhaps not ill founded, that that particular property of the bee must be resolved at last into the mere effect of a powerful instinct, the principles of which cannot be defined. We cannot adduce a more apposite illustration of the foregoing remarks, than the circumstance witnessed by ourselves in company with Bonner, on an excursion which we made to the isle of Bas at the entrance of the Forth, on which there is not a single human dwelling, and which presents nothing more than one unbroken surface of heath, without the slightest vestige of cultivation. It was, however, a matter of great surprise to us both, to observe the heath covered with bees, actively extracting the mellifluous juices, at the same time that we knew that there was not a single hive of bees on the island. It must therefore have been from the nearest land, the East Lothians, that the bees had winged their flight across several miles of ocean to collect the treasures which the heath of the island afforded them. Here then was a subject of curious and interesting inquiry. It could not be admitted that the bees had been guided to the island by the sense of smell, for the exhalations of the ocean were quite powerful enough to neutralize any odour which might issue from the heath; nor could the bee be guided by the sense of sight, for even supposing that the vision of the bee was powerful enough to bring the distant island within its range, it does not thence follow that the bees would enter upon a perilous speculative journey over the ocean, on the mere chance of finding something to repay them for their risk and trouble.

No doubt whatever can exist that the antennæ are the

organs of smell in the bee, and numerous experiments have been instituted for the purpose of ascertaining the possibility of the bee performing its usual functions, were it to be deprived of them. It is, however, a fact now well known to all apiarians, that to deprive a bee of its antennæ is to render it to all the purposes of the hive a useless member of the community. Huber coincides in that opinion, but Duncan dissents from it. Thus the former says, "a queen or a working bee, which has had one of its antennæ cut off *is no longer able to perform its ordinary avocations;* if both be cut off, it is obliged to leave the hive, as being of no use whatever to the community." In opposition to the above, on referring to Duncan we read, "that the queen leading off a first swarm in one year has been marked by depriving her of one of her antennæ, and she has been found at the head of a first swarm the following year." Thus, according to Duncan, a queen bee, although shorn of one of her antennæ, is not only, in opposition to the opinion of Huber, capable of performing all her ordinary avocations, but actually to put herself at the head of a swarm, as if no mutilation whatever of her body had taken place.

In regard, however, to the antennæ, Huber has discovered that it is by means of that organ that the bees communicate to each other any disastrous event that has befallen them, particularly the loss of the queen. In this instance, however, the inconsistency of Huber is most striking; for in one place he confesses that he cannot discover the means by which the bees communicate their intelligence either favorable or unfavorable to each other; but, directly afterwards, the light suddenly bursts upon him, and he says, that on one occasion the bees flew with the utmost rapidity to impart the doleful news of the loss of the queen, which he discovered was effected by the *bees reciprocally crossing their antennæ and then striking them.* In order to prove that this notable discovery was no baseless fiction, Huber

says, that he *saw* the bees crossing their antennæ in every direction, some *crossing them, some striking* them; and by this method was the loss of the queen imparted to the whole community; the immediate result of which was, that the bees were plunged into a state of the most pitiable despair and despondency.

According to the statement of Huber, this crossing of the antennæ of the bees may be considered as somewhat analogous to the manual salutation of two men; but we are wholly at a loss to divine what Huber means by *striking* the antennæ, and as we never witnessed the operation, we must leave it in its original obscurity. It is however very probable that as the antennæ of the bees are in constant motion, they might, on encountering one another, appear to Mr. Huber, as if they were designedly crossed; but that it is one of the natural habits of the bee for the purpose of communicating any disastrous intelligence, is not the least of the many fictions for which that naturalist is so celebrated. In regard to the crossing of the antennæ being a fixed habit of the bee for some specific purpose, he would have been just as near the truth had he informed us, that two bulls cross their horns for the purpose of informing each another of the death of a cow.

There is, however, another point in which we totally differ from Huber in regard to the use of the antennæ, for he makes them not only the organs of smell, but also of sight, and he extends this hypothesis so far as to assert, that it is by means of the antennæ acting as instruments of vision, that the bees are able to construct their combs in the darkness of night, besides other important uses to which they are applied. Mr. Duncan, instead of putting a decided negative upon this statement of Huber, tacitly acquiesces in it, for he says "that Huber was probably not wrong in ascribing to the antennæ an important share in those operations;" but let us ask Mr. Duncan whether the interior of a

hive even at midday be not in complete darkness, nor is that darkness in any manner increased even at midnight. If therefore the principle be admitted, that the interior of a hive be in the same state of darkness at midday as it is at midnight, it follows thence as a natural conclusion, that if the common vision of the bee be all that is requisite for the prosecution of its labours in the interior of the hive during the day, it is equally sufficient for the prosecution of its nocturnal labours, leaving the problem after all without any solution, whether the bees are actually devoid of sight in their in-door operations; at all events, the fact is universally admitted, that the bees will only work in complete darkness, and that the smallest admission of light throws them into disorder and confusion. There is not any doubt that it is by means of the antennæ that the bees recognize each other, that is, by the peculiar odour emitted by them. It is not by any identity of person that the bees recognize a friend or a foe; but every hive has an odour peculiar to itself, and the antennæ or the organ of smell are no sooner applied to a bee, than the discovery is immediately made, as to whether it belongs to the hive, which it is about to enter, or whether it be a marauding vagabond from some other hive.

It is, however, not a little singular, that notwithstanding all the experiments of Huber, and his alleged profound researches into the natural history of the bee, he appears at the close of them to be in as great doubt and uncertainty as to the locality of the organs of the senses as when he set out upon his discoveries; and so far from coinciding with the eminent naturalists who preceded him, as to the locality of the organ of smell, he disseminates the untenable hypothesis of that sense being resident in the mouth: and no one can peruse the account of the experiment which he instituted to determine that point, without experiencing a deep sense of regret at so preposterous a notion being

introduced and admitted by certain individuals, as accredited facts in the natural history of the bee. It appears that Huber dipped a camel's hair brush into some turpentine, and applied it to various parts of the body, without the bee betraying any symptoms of an uneasy feeling. He applied it to the antennæ, and the eyes without any visible effect; we have done the same, but so far from the bee not betraying any symptoms of an uneasy feeling, the bee was dead in three minutes afterwards. The bee, however, on which Huber tried his experiment appears to have escaped that heavy infliction; but, according to his statement, when the turpentine was applied to the mouth, the bee *started*, and well indeed it might, for it was a species of aliment by no means congenial to its taste—it forsook the honey on which it had been previously regaling, and was preparing to take to its wings, when the turpentine was withdrawn. The climax, however, of this experiment is yet to come; for Huber having obtained some paste, proceeded to close up the mouth of the bee, when he discovered that the bee appeared to have lost the sense of smell altogether; from which the inference is drawn that the mouth is the organ of smell: in which most extraordinary opinion Mr. Duncan coincides, for he says, *the organ of smell therefore appears to reside in the mouth, or in the parts depending on it;* and Mr. Duncan closes his remarks with the following sagacious advice, which is, that, should any one be desirous of repeating this experiment, the first step to be taken is to cut off the sting of the bee; and we may add, if the experimentalist wishes to kill the bee, paste up his mouth, and the act will very soon be accomplished.

In regard to the sense of sight, the bee has two reticulated eyes placed on either side of the head, consisting of a number of hexagonal surfaces thickly studded with hairs, which protect them from exterior injury. Some naturalists have given them also three stemmata or coronetted eyes,

which, according to the hypothesis of Blumenbach and Reaumur, are solely appropriated to vertical vision, the reticulated eyes being used for horizontal vision. We must, however, in opposition to the opinion of two such celebrated naturalists, presume to affirm that these coronetted holes or cavities have no relation whatever with the power of vision, and we are rather inclined to consider them as the organs of hearing, than those of sight.

We, no doubt, shall be accused of treating the highly vaunted discoveries of Huber with levity and an unbecoming severity; but when the experiments on which he founds those discoveries are revolting to common sense, and at variance with all probability, the mind naturally feels indignant at the imposition that is attempted to be practised upon it, and feels a pride in the exposure of the offender. Thus Huber, in order to ascertain the visionary power of the coronetted holes, fell upon the extraordinary experiment of blindfolding the reticulated eyes of the bees, but by what means that extraordinary act was accomplished, Huber is most provokingly silent. The result of this experiment however was, that although the blindfolding was supposed to be complete, still the bee was not wholly deprived of sight, but its flight, instead of being horizontal, was vertical. Thus the important decision was arrived at, that the bee possesses two kinds of vision, one, that enables it to fly straightforward, and another that enables it to fly upwards. A decision, which as far as truth is concerned, is wholly valueless. The late Sir Joseph Banks was severely flagellated with the lash of ridicule for boiling fleas to ascertain if, like lobsters, they would turn red, but that experiment dwindles into positive insignificance, when compared with that of blindfolding a bee to determine the power of its vision. The bee is not an insect to remain docile or passive during the performance of the operation, and delicate indeed must have been the hand, that

attempted its execution. In the performance of the act of pasting up the mouth, Mr. Duncan recommends the cutting off the sting, and we recommend the same plan to be adopted when the bee is blindfolded, or the experimentalist will most probably pay dearly for his temerity. On the whole, we are greatly disposed to call in question the validity or the veracity of those pretended discoveries, which are built on such improbable, and almost impracticable experiments; for the man who will attempt to blindfold a bee, must have a peculiar method of handling that insect, to which we profess ourselves to be decided strangers.

In regard to the sense of taste, it is perhaps the most defective and the most indefinite of all the senses of the bees, and the general habits of the insect prompt the belief that it cannot be reduced to any fixed principle, and it is rather singular that scarcely one of the modern naturalists has ventured upon determining its locality. All that has hitherto been done is to establish its claim to purity, and even on that point several very eminent naturalists hold a contrary opinion. Huber considers the taste of the bee to be very depraved, on account of its partaking of offensive liquids; but in this instance, Huber was rather begging the question, for of what offensive or fetid liquids do the bees partake? We are not aware of any; on the contrary, we know of only one liquid of which they partake, independently of their natural food, honey, and that is water. Huber, however, is according to his usual custom guilty of gross inconsistency in regard to the purity of the taste of the bee, for he attempts in the first instance to demonstrate the defective taste of the bee, arising from its imbibing the impure fluid from corrupt places, and then, in the second instance, to prove from various circumstances the extreme purity of its taste. Mr. Duncan, however, in order to establish the defective

state of the taste, says, that the bees towards the close of the year, when flowers become scarce, and in those parts of the country where alders abound, and where onions and leeks are cultivated on a large scale, and allowed to run to seed, the bees from taste, or necessity, or from anxiety to complete their winter store, are seen to feed on those plants, which communicate to the honey a very disagreeable flavor. In answer to the above, we will merely state, that if Mr. Duncan had searched the whole vegetable kingdom, he could not have selected two plants more obnoxious and offensive to the bee than the onion and the leek, and we will fearlessly challenge Mr. Duncan to authenticate a single instance in which the bees were known to feed on the umbellæ of either the onion or the leek, neither of them yielding the slightest drop of honey, nor a particle of farina which the bees could gather. There is, however, another circumstance which will invalidate this statement of Mr. Duncan, which is, that the onions and leeks are said to run to seed when the flowers have become scarce. Now, the seed of those bulbs ripen, and are gathered in July and August, when some of the flowers richest in honey are in full bloom, and in fact at a time when the harvest of the bees is in its most flourishing state; and will the bees condescend to visit the fetid coronets of the onion and leek, when they can regale themselves on the odoriferous mignonette? And as to the alders—what does, or what can the bee obtain from that cheerless and barren shrub? A forest of alders would not yield a single drop of honey, nor are the bees ever seen to alight upon their leaves, except as a temporary resting-place.

The taste of the bee may be considered as twofold, that of the proboscis, and that of the mouth; the former being applied solely to honey as its principal aliment, and the latter to the mastication of the farina wherewith to make

the wax, nor can it be considered as very acute, as it is simply employed on one substance, without perhaps any great diversity in its constituent principles.

The sense of *feeling* or touch has been very erroneously supposed to exist in the antennæ, and in order to confirm that hypothesis, Hubert instituted an experiment, in which he confined a queen, so that her subjects could not recognize her immediate presence, which occasioned so great a despondency at the supposed loss of their monarch, that, by the aid of a little royal jelly which happened to be very conveniently at hand, they began to manufacture another queen. On a sudden, however, the wire grating, which had hitherto concealed her majesty, was so far withdrawn, as to allow her to project her antennæ, and the bees immediately recognized their former monarch and the affairs of the monarchy went on as usual. Now, we are at a loss to conjecture on what grounds Mr. Huber can from the foregoing experiment draw the inference, that the antennæ are the organ of feeling; for it is but a confirmation of the hypothesis, that the antennæ are the organ of smell, but that they have no relation with either the sense of feeling or touch. Indeed the locality of those senses may be considered as general, like the majority of all other animal bodies, and not confined to any particular organ.

In the earlier period of the history of the bee, Swammerdam, Maraldi, Reaumur, Bonner, and Shirach certainly divested it of much that was marvellous, ridiculous, and incongruous, and they rendered the study of it more easy and interesting, by the establishment of many truths, and the promulgation of new and various phenomena which came under their immediate observation. In the vast field, however, which they traversed, notwithstanding the abundance and richness of their harvest, there yet remained much to glean. Since their time, science has been gradually unlocking her stores, and the mists of prejudice have been

dispersed by the penetrating rays of philosophy. The treasures of nature are inexhaustible, and there is certainly no department in her vast domain, in which curiosity and amusement are more intimately blended, than in the study of the bee.

Let it not, however, be supposed that it is a study attended with facility, or that the hopes of success are in proportion to the time and talent that are expended upon it. In the majority of experiments, disappointment follows so closely upon disappointment, that even the most enthusiastic admirers of the bee frequently become discouraged, and retire from any farther research, with the conviction on their mind, that success is not attainable, and that that which has baffled the most celebrated naturalists of all countries and of all ages, will continue to baffle them. In many of the disputed points of natural history, analogical reasoning has been found to be the surest guide to the discovery of truth, but in the physiology of the bee analogy is of little or no use: the bee, in the animal world, stands singly, in its characteristics, its relations, and natural habits, nor can we call in the aid of science to assist us in the elucidation of the mysteries in which its natural history is enveloped. We stand in the present age, but, as it were, in the vestibule of apiarian knowledge, and Mr. Duncan never penned a passage more consistent with truth, than when he says, "Some of the discoveries which have been blazoned in publications both at home and abroad will be found, on strict examination, to have no existence but in the warm fancy or *blind* enthusiasm of the observer."

What an extraordinary confession from an adherent of the *blind* Huber!!

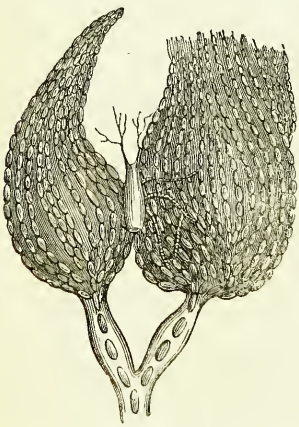
SECOND CHAPTER.

THE QUEEN BEE.

THE QUEEN BEE THE MOTHER OF ALL THE INMATES OF A HIVE—ORGANIC STRUCTURE OF THE QUEEN BEE—POSITION OF THE EGGS IN HER OVARIUM—INVESTIGATIONS OF THE FRENCH AND ENGLISH APIARIANS—THE FECUNDATION OF THE QUEEN ACCORDING TO THE SYSTEM OF HUBER—DIFFICULTY ATTENDING THAT SYSTEM—THE QUEEN BEGINS TO LAY HER EGGS IN JANUARY—BOSTEL AN ADVOCATE FOR THE SELF-FECUNDATION OF THE QUEEN—THE DRONE DETERMINED TO BE THE MALE BEE—THE OVARIUM OF THE QUEEN, ACCORDING TO HUBER, FECUNDATED FOR THE WHOLE OF HER LIFE BY A SINGLE ACT OF COITION WITH THE DRONE—NUMERICAL FECUNDITY OF THE QUEEN BEE (Note.)—NUMBER OF OVIDUCTS IN THE OVARIUM OF THE QUEEN—NUMBER OF EGGS IN THE OVARIUM—THE EARLIEST APPEARANCE OF EGGS IN THE OVARIUM—SOME DRONES SURVIVE THE WINTER, ACCORDING TO BONNER—DENIED BY SIR JOHN SINCLAIR—THE SEXUAL INTERCOURSE OF THE QUEEN AND THE DRONE ADVANCED BY THE FRENCH APIARIANS—REMARKS OF THE MONTHLY REVIEWERS (Note.)—NUMBER OF EGGS LAID BY THE QUEEN IN ONE HOUR—LUTTICHAU AN EYE-WITNESS OF THE ACT OF COITION—DETECTION OF THE DRONE IN THE FECUNDATION OF THE EGG—MICROSCOPICAL EXAMINATION OF THE SEMINAL MATTER—THE FECUNDATION OF THE EGG IN THE CELL CONFIRMED BY DEBRAW—THEORY OF SWAMMERDAM—THE HYPOTHESIS OF L'ABBE DELLA ROCCA RELATIVE TO THE COPULATION OF THE QUEEN AND THE DRONE (Note.)—THE QUEEN BEE NEVER LEAVES THE HIVE—THE CONTRARY ASSERTED BY HUBER—THE PERIOD OF HER ABSENCE FROM THE HIVE—EFFECT OF HER ABSENCE ON THE BEES—THE DRONE, ACCORDING TO HUBER, DIES AFTER COPULATION—SINGULAR DISCOVERY OF HUBER IN REGARD TO THE DRONE—EXPERIMENT OF HUBER WITH SOME YOUNG QUEENS—THE YOUNG QUEENS DEPART WITH THE SWARMS—CONFIRMED BY SWAMMERDAM—CONTRADICTION OF HUBER RELATIVE TO THE OLD AND YOUNG QUEENS—THE YOUNG QUEEN BEE COMMENCES TO LAY HER EGGS IMMEDIATELY AFTER BEING SETTLED IN THE HIVE—EXPERIMENT TO DETERMINE THE SAME—EXPERIMENT OF HUBER WITH THE QUEENS AND DRONES—INCONSISTENCY OF THE EXPERIMENT—QUEEN BEES, ACCORDING TO HUBER, BRED IN OCTOBER—EXPERIMENT THEREON—ITS FALLACY—THE SYSTEM OF RETARDED IMPREGNATION—ITS EFFECTS ON THE EARLY OR LATE OVIPOSITING OF THE QUEEN—THE DISPROPORTION OF MALES TO FEMALES IN A HIVE CONSIDERED—THE YOUNG QUEEN LEAVES THE HIVE TWENTY-FOUR HOURS AFTER HER BIRTH—OPINION OF MILES—CONSTRUCTION OF THE CELL IN WHICH A QUEEN IS BORN—EXACT POSITION OF THE CELL IN THE HIVE—DIFFERENT STAGES OF THE GROWTH OF A QUEEN—PERIOD OF A BEE ARRIVING AT MATURITY—MANNER IN WHICH THE QUEEN BEE LAYS HER EGGS—THE SYSTEM OF THE EGG FECUNDATED IN THE CELL BY THE DRONE—ANALOGY BETWEEN THE BEE AND THE WASP—EXPERIMENTS TO DETERMINE THE FECUNDATION OF THE EGG—HYPOTHESIS OF MR. DUNBAR—FRUCTIFIED EGGS REMAIN IN THE HIVE IN THE BROOD COMBS DURING THE WINTER—THE QUEEN BEE LEAVES THE HIVE IF THERE BE NO VACANT CELLS IN WHICH TO DEPOSIT HER EGGS—REMEDY FOR THAT DEFECT—REPUGNANCE OF THE QUEEN BEE TO STING—ATTACHMENT OF THE BEES TO THEIR QUEEN—THE CEREMONY OF LAYING THE EGGS ACCORDING TO HUBER—ESTABLISHMENT OF THE GUARDS—PERIOD OF DEPOSITING THE EGGS—TEMPERATURE OF THE HIVE—NUTT ON THE TEMPERATURE OF A HIVE—THE EGGS HATCHED THE THIRD DAY AFTER THEIR DEPOSITION—PROGRESS OF THE BEE TO MATURITY.

The Queen, or Mother Bee, holds the first rank in the colony;—she is the parent of all the young queens, drones, and working bees: in fine, of the whole family, who emigrate from an old hive to found a new establishment, and form for themselves a colony in another place.

The make of this wonderful insect is wholly different from that of the other bees. Like the drones, she has no triangular cavities in her hinder legs, which are appropriated, in the common bee, to the reception of the farina of plants. Her teeth are smaller than those of the common bee, but larger than those of the drones, and she has no brushy substance at the end of her feet;—in regard to her body, she is longer and more taper than the drone, but the most decided characteristic of the queen bee, is the shortness of her wings, which extend only to the third ring of her body, whilst the wings of the working bees, and especially those of the drones, extend almost the whole length of the body. From this comparative shortness of her wings, the queen flies with greater difficulty than the working bee, and, indeed, during her life, it seldom happens that she has any occasion for them. The under part of her body is of a golden colour, and the upper part of a brighter brown, than that of the common bee. In the interior of her body the eggs are distributed



in two ovaria, each ovarium being an assemblage of an astonishing number of ducts, terminating in one common channel, and all of which are filled with eggs during the breeding season.

The fecundity of the queen bee is most astonishing, and scarcely to be equalled in any other insect or animal, with the exception of fish. She lays her eggs as long as there is a cell in which to deposit them, and the first question to be decided is, in what manner and at what time are those eggs fecundated? There is not, perhaps, any subject in the whole physiology of the bee, on which a greater contrariety of opinion has been held, or to which a more minute attention has been paid. Hypothesis has been heaped upon hypothesis, each, perhaps, more absurd and untenable than the other. Systems of the most extravagant nature have been adopted, and the whole force of human sagacity and ingenuity has been taxed to discover this great secret in the works of nature; but after all these exertions, the same doubt exists as at the commencement of the investigation. The English apiarians, Thorley, Varder, Wildman, Bonner, Keys, &c., have each had his respective system, and each fancied that he was the fortunate discoverer of the secret. The French apiarians have studied this matter more scientifically and profoundly, but in some of their systems, the greatest inconsistency and contradiction prevail.

According to the system of Huber, the queen is fecundated by a single act of coition with a single drone, but the very circumstance by which this fecundation takes place, namely, by a casual rencontre in the open air, verges very nearly upon the impossible. Huber does not affirm that the queen takes the drone with her, but that they encounter each other by chance, and that from this one act of coition, the ovarium of the queen is sufficiently fecundated for the whole season, and not only for the current year, but for the remainder of her life. There is something directly contrary

to reason in this hypothesis, for nature never or seldom creates an object in vain, and therefore it is not to be supposed that she would have created eight hundred or a thousand drones in a hive, when one was all-sufficient for the purpose for which they are called into existence. Huber clearly perceived that although he advocated the system of a sexual intercourse, the notion could not be tolerated that such intercourse took place in the hive *, and therefore he was driven to the necessity, in order to prop up his theory, to send the queen on a roving expedition with a single drone as her paramour into the upper regions of the air. There is, however, one difficulty in the system of Huber, regarding the fecundation of the queen, which we predict that his most enthusiastic adherents will be perplexed to solve; and we candidly confess that it is a difficulty, which belongs not only to the system of Huber, but to almost every other system, which has been founded respecting the fecundation of the eggs of the queen. She generally begins to lay her eggs by the latter end of January, when there is not a single drone in the hive; her ovaria have been empty during the whole of the winter, and the question then naturally presents itself by what prolific power have those eggs which are laid in the spring been fecundated? There was not any drone existing to accompany the queen to the woods, and consequently there was not any power active in the hive by which either her ovarium could be fecundated, or the eggs fructified after their deposition in the cell. It was this difficulty, which gave rise to the notion, that the queen possessed the

* Lombard says, "In the hive, the drones testify a perfect indifference towards their queen, and this he designates as the result of an admirable order, for," he continues, "were it otherwise, there being at one time of the year from 1500 to 2000 drones, the queen would have no repose, all would be hastening to enjoy her, and she would not find time to eat, nor to lay her eggs: her rencontre and copulation with the drone take place exteriorly to the hive, and whilst they are on the wing. It is similarly constituted with the whole family of flies."

power of self-fecundation *, or that she was in the strictest sense, a virgin mother queen. The fact, however, having been indisputably established, that the drone is a male, invested with the organs of generation, it had an immediate tendency to invalidate the hypothesis of self-fecundation; for, although the direct manner in which the procreating power of the male was exercised could not be discovered, yet the existence of a number of males being established, it was a natural deduction, that the queen was fecundated, either by sexual coition, or that the egg was fructified after its deposition in the cell. Several almost insuperable objections exist to the former, some of which have a direct tendency to disentitle it to the slightest support; indeed, we look in vain for any analogy existing in nature confirmatory of the system as laid down by Huber. The fructification of an ovarium by a single act of coition with the male, the spirit of which is to operate on every egg, not only then existing in it, but which might be engendered in it for two or three successive years, or even during the whole life of the queen, carries with it, in its very principle, such a gross and manifest absurdity, that bold indeed must have been the individual, who could send it forth as the result of experience, and unbounded, indeed, must have been the credulity of those, who could attach the slightest credence to such a romantic fiction, and yet, strange to relate, it forms one of

* Bostel is an advocate for the self-fecundation of the queen, as he deprives the drones of the prerogative of being the male in the hive, but at the same time omits to tell us what they really are. His hypothesis, however, is grounded on the following experiment;—take the opportunity, when the supernumerary queens have perished; deprive the swarm of the only queen bee that is in it, and then by means of the bath, invented by Reaumur, take away all the drones that can be found,—then for the queen, which you have taken away, put another at the moment when she is about to pierce the covering of her cell, and place your swarm at such a distance from the other hives, that the drones cannot have access to it, the virginity of the queen is then placed beyond all suspicion, and yet this swarm will nevertheless produce brood, working bees, drones, and queens. We need scarcely add, that there are points in the above system, which would baffle the skill of all the apiarians in the kingdom.

the chief pillars of Huber's system. It has been quoted, as a verified case, in the elementary works on entomology; it stands in the pages of all the Encyclopædias, with the exception of the Cyclopædia Edinensis, and the London Cyclopædia, as a principal feature in the natural history of the bee; whereas such a startling proposition as a perpetually fecundated ovarium should have made the compilers of those works hesitate, before they admitted into their pages such an incoherent stretch of fancy, at the sacrifice of truth and common sense.

Huber was not insensible to the force of the objection, which was raised to the fecundation of the queen by a single drone, and the consequent inutility of eight hundred or a thousand drones being born, when a single one was sufficient for all the procreating purposes of the hive, and not only for that particular season, but for the whole life of the queen. In order, therefore, to supersede that objection, Huber observes, that it is actually necessary that the males should be numerous, in order that the queen may have the chance of meeting with *one* of them, and, thus, nature is made to create nine hundred and ninety-nine useless creatures, in order to enable the queen, in her aerial excursions, to come into contact with the remaining one of the thousand. Supposing, however, according to the dictum of Huber, that the single act of coition be sufficient to fecundate the ovarium of the queen for the present year, and thereby fructify every egg, that may be generated in it, we are then entitled to draw the conclusion, that in the subsequent spring, a fresh act of coition would be requisite in order to fecundate the eggs of the current year; but this condition according to Huber is by no means necessary, for although nine hundred or a thousand drones may be born, the queen has no occasion whatever for their services; her ovarium having been fecundated the preceding year, and as the vivifying principle is still active, the same process of multiplication would go on,

although there was not a single drone in the hive. It is very easy for the mind to conceive a cluster of eggs to be fecundated by a single act of the male, as is witnessed in the fish and the frog, and, indeed, in almost all insects; but it must, indeed, be a wild bound of the imagination which can entertain the doctrine of an almost infinite number of eggs being fructified in the ovarium of an insect, in the year 1837, which eggs, however, were actually at that time not in existence, by an act of the male committed in 1835 or 1836*. In the case of the silkworm, and of almost all flies, the eggs in the ovarium of the female are fructified by a single act of the male, and we would most readily accede the point, that analogically considered, the same case might take place with the eggs in the ovarium of the queen bee, but there exists a wide difference in the nature of the two insects. At the time when the act of coition takes place between the moths of the silkworms, all the eggs which the female will lay are existing in her ovarium, their number at that time are definite, and no after-growth or accumulation takes place, but it is otherwise constituted with the queen bee; from the moment that she begins to lay her eggs, they are in a state of gradual production and growth. We once counted three hundred and five oviducts in a queen bee, and in each oviduct there were eighteen eggs, thus, three hundred and five multiplied by eighteen, gives the enormous sum of five thousand nine hundred and forty eggs in one female insect, and yet all of them so differing in size, that the rudiments of the last were scarcely perceptible. Consistently, therefore, with this experience, the eggs which are laid in the month of May were not in the ovarium of the queen in the

* It must be admitted that Huber does not exactly affirm that the eggs are n the ovarium, but the system on that very account becomes still more difficult of comprehension and belief. An everlastingly fecundated ovarium by a single act of the male, and the hypothesis of self-fecundation, stand nearly upon similar grounds of authenticity.

month of March; consequently, if the act of coition with the drone took place in the latter month, we naturally inquire, by what power were the eggs fecundated in the month of May? This was a question which Huber no doubt put to himself, and perceiving that it would not be consistent with his theory, to allow of any act of coition, subsequently to the first, he fell upon the extraordinary conceit of one single act of coition being all-sufficient to fructify the ovarium of the queen for the whole remaining period of her life. The ovarium of the queen is entirely empty during the winter months, and the earliest period that we ever knew of the appearance of an egg in it, was the 20th of January. The growth of these eggs is so exceedingly rapid, that by the 27th, some of them were laid in the cells *; and now arises one of the most difficult points in the whole natural history of the bee. In what manner are the eggs so laid in January rendered prolific, there not being a single male in the hive, either to copulate with the queen, or to fructify the egg in the cell? Bonner, in order to surmount that difficulty, invented a number of little drones, which were by courtesy

* A correct idea may be formed of the wonderful fecundity of the queen bee by the following statement, taken from an actual calculation of the number of insects composing the population of the original hive, and of a first swarm, every egg of which has been laid by the queen.

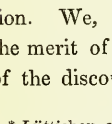
One full grown queen bee in the original hive - -	1
One full-grown queen in the swarm - - -	1
Queens in cells of the original hive - - -	9
Full-grown working bees in the original hive - -	8,494
Full-grown working bees in the swarm - -	2,433
Full-grown drones in the original hive - - -	693
Full-grown males in the swarm - - - -	278
Nymphs of queens - - - - -	5
Nymphs and worms of working bees - - -	6,468
Nymphs and worms of drones - - - -	858
	19,240

The number of cells in a hive are about 23,000. At one time we counted 6468 sealed cells, 210 of which had brood. The cells, in which bees had already been hatched, amounted to 7814. According to the above statement the population of a hive amounts to about 10,000.

allowed to remain in the hive for the express purpose of fecundating these eggs; but as Sir John Sinclair very pointedly expressed himself, they were no where to be found, but in the brain of the worthy enthusiast. For the same reason, Huber invented his everlastingly fecundated ovarium, and it must be admitted that the latter invention, as far as originality is concerned, has the advantage over that of the enthusiastic Scot. The falsity of the former is subject to immediate detection—the latter can only be subverted by reason and analogy, based on an extensive experience in all the habits of the insect. The everlastingly fecundated ovarium of Huber has been justly denounced by the foreign naturalists, as unworthy of the slightest consideration, and they have rightly determined that it ought to be exploded, as a direct chimera, from the natural history of the bee. Nevertheless, amongst the scientific men of France, there are many advocates for the sexual intercourse of the queen and the drone, as they consider it more consistent with the analogies of nature, than the theory of the fructification of the egg in the cell *. The rapid manner in which the queen lays her eggs, combined with other circumstances, gives almost a decided negative to that hypothesis, it being admitted, as in the case with fowls and all other oviparous animals, that every egg, previously to its deposition, receives the prolific principle of the male. Now, concurrent with the testimony of Huber himself, and we may add with the majority of apiarians, the queen bee hastens from cell to cell, in which she oviposits, without coming in contact with any

* In the review of the first edition of my Treatise on Bees, in the Monthly Review, the critic says, that my system of the fructification of the egg, after its deposition in the cell, is contrary to the analogies of nature. In the preface to the second edition, those objections were refuted, by adducing the fish and the frog, as instances of the eggs being fructified after their emission from the body of the female. I confess my inability to trace any analogy in the insect tribe, but in that respect, the system of Huber and my own stand exactly upon a par.

drone. We have known a queen bee lay from fifteen to twenty eggs in a quarter of an hour, and consequently, we have only two hypotheses to guide us; either, that an act of coition takes place between the deposition of every egg, or that a number of eggs are fructified at one time, as it were, by wholesale. The former comes scarcely within the range of possibility, and is at direct variance with experience. We have examined a hive under every relation and circumstance, and we never yet succeeded in entrapping the queen in the state of actual coition with the drone *. But we have succeeded in several instances in detecting the drone with his body in a cell, and on cutting out that part of the comb, we always found the egg at the bottom of the cell, and the seminal fluid enveloping it. We submitted this fluid, which was of a whitish hue, to a powerful microscope, and we observed a number of animalculæ floating in it, of the annexed



form. It thus became, as it were, demonstrated to us, that no sexual intercourse takes place between the queen and the drone, but that the egg is fructified in the cell, after its deposition. We, however, by no means arrogate to ourselves, the merit of this discovery, for it is but the confirmation of the discovery of Debraw, and others, who have shown

* Lüttichau, a German apiarian, expresses his doubt of the act of copulation taking place in the open air, although he does not positively deny the fact; but he asserts, with the greatest confidence, that he has actually viewed it in the hive, and that he once stuck the queen with a needle, during the act of coition, and on examination, he found the organ of generation of the drone in the queen. We have only one remark to make on the above statement, which is, that as Lüttichau is the only person who ever witnessed the act of coition between the queen and the drone, we are not inclined to consider the fact as verified. Scopoli, also a German apiarian, whose work on bees is written in Latin, and translated by Meidinger, for the purpose of arriving at the truth or fallacy of the queen being fecundated in the open air, cut the wings of the queen at the commencement of the spring, and in the autumn he found the same queen in the hive. Two excellent swarms had been obtained during the summer, and although he was not an advocate for the system of the copulation of the drone with the queen in the hive, the above experiment convinced him that it did not take place in the open air.

themselves the decided opponents of the Huberian system of sexual coition.

Swammerdam rejects the theory of any sexual intercourse, either interiorly or exteriorly of the hive, as a circumstance scarcely possible; and, not knowing how to account for the fecundation of the queen, he resorted to the antiquated opinion of a prolific effluvium issuing from the male, and which was in such a constant state of emission, that the ovarium of the queen was always in a fecundated state *.

The circumstance of nine hundred or one thousand drones, all being males, and generated in one season in a hive, with only one female with whom to multiply their species, is in itself strongly refutatory of the hypothesis of coition. Nature furnishes us not with a single precedent, in which such a disparity of sexual power exists, or in which such an extraordinary disproportion of numbers manifests itself between the female and the male.

The fecundation of a certain portion of the eggs existing at any given period in the ovarium of the queen, is liable to the same objection, and carries with it difficulties, which amount nearly to its almost absolute impossibility. There is, however, one circumstance not yet adverted to, in the system of Huber, which, were no other proof of its falsity existing, would of itself be sufficient to establish it. Huber asserts that the queen leaves the hive for the purpose of being fecundated, whereas, on the other hand, we maintain that the queen never leaves the hive for any purpose whatever. Huber, however, soon perceived that by sending the queen out of the hive, he had proceeded in defiance of the

* L'abbe della Rocca, speaking of the copulation of the queen, says, "Leur derrière est souvent courbé en dessous; c'est leur situation ordinaire; dans l'accouplement, 'elles montent sur le dos du mâle.'" Solomon says there is nothing new under the sun; it must be admitted, however, that it would be something very new in the operations of nature, to observe the female "monter sur le dos du mâle," for the purpose of procreation.

generally received opinion: and he therefore qualifies his assertion by saying that it is only in a *natural state* that the queen leaves the hive, but this is a qualification not very comprehensible, for at what time is the queen in an *unnatural state**? We, however, hesitate not to affirm, that if the queen do leave the hive, as represented by Huber, her absence would be immediately discovered, and the whole hive thrown into confusion. The queen bee, however, according to Huber, speaks the French language, independently of being invested with other miraculous powers, and, therefore, it is probable she may be gifted with the faculty of informing her subjects of the precise intent of her journey; and, consequently, that no confusion nor interruption takes place in the affairs of the monarchy during her absence. Huber, however, must have been in some degree aware of the existence of this interregnum; for he very properly places a limit to the time, which the queen occupies in vagabondizing in the regions of the air, and according to his experience, it never exceeds half an hour. By what means, however, he arrived at that knowledge, it is most difficult to decide. He must have witnessed the precise moment of her departure, in order to enable him to determine the exact duration of her absence; but we will venture to affirm, that during the whole of our experience, the cases are very rare in which we succeeded in witnessing the queen leave the hive, even at the departure of a swarm. We have, however, tried the experiment above fifty times, of taking away the queen, for the express purpose of ascertaining the natural disposition of the bees, on the supposed loss of their monarch; and in every case, not a minute elapsed before the whole community were in confusion. The bees were to be seen

* According to Mr. Huber, the *natural* and *unnatural* state of the queen is made to depend on the following circumstance. If her impregnation has taken place at the proper period, she is then in a *natural* state; if it has been retarded, she is then in an *unnatural* one.

running about in all directions, as if in search of some particular object, and apparently disposed to quarrel amongst themselves, on account of some calamity which had befallen them. In not a single instance, has it ever come under our experience, that the bees, on the loss of their queen, did not gradually dwindle away, and ultimately leave the hive; and, further, no doubt whatever can exist, that the desertion of a hive by the bees, which so frequently takes place, and the cause of which appears so difficult to determine, arises in the majority of cases from the death of the queen. It is generally attributed to the dearth of provisions, or, in certain parts of England, to the influence of some malignant witch, who has enticed the bees away, as an act of spite towards the owner, and it must be acknowledged that the death of a queen is a circumstance, which takes place so secretly, and, perhaps, so unexpectedly, that no opportunity presents itself of repairing the loss, or instituting those measures which might lead to the salvation of the bees. The queen bee appears on all occasions to be fully conscious of her extreme importance and value to the community, over which she reigns, as she never places her life in jeopardy, nor exposes herself to those dangers, by which she would be surrounded, were she to be addicted to those amorous excursions, which are so circumstantially described by Huber, and which have so enraptured the fancy of his numerous commentators.

There is one discovery, however, which Huber made respecting the fecundation of the queen, which we cannot allow to pass unnoticed; namely, that the drone, like the moth of the silkworm, dies after copulation: and he avers, that on the arrival of the queen at the hive from her amours with the drone, he has actually observed the seminal matter at the extremity of her abdomen *. Huber, however, sub-

* Lüttichau, Janscha, Kratzer, Müller, and other German apiarians, pretend to have discovered seminal matter on the posterior of the queen. It is,

sequently perceived that this fanciful tale of the seminal fluid on the exterior of the abdomen of the queen, could not possibly be credited by any person, possessing the least degree of discernment; and therefore, rather than others should detect and expose the absurdities of the statement he judged it more politic and wise to acknowledge that he was himself deceived; for he confesses that that, which he took to be the seminal fluid, was found after all to be nothing more than an illusion, caused by the reflection of the rays of light. But this illusion after all turned out to be a most extraordinary object, being nothing less than the genital organ of the drone, which the queen had actually brought away with her, and as this most astounding discovery cannot fail to afford considerable amusement, but, at the same time, excite some degree of pity for the individual, who could send forth such an absurdity into the world as the result of positive experience, and as actually belonging to the natural history of the bee, we will allow Mr. Huber to recount the phenomenon in his own words. In the first place, he discovers that the seminal fluid of the drone bee coagulates in the open air; and consequently, whenever the queen returned with the external marks of fecundation, no doubt whatever existed in the mind of Mr. Huber, that it was the whitish substance which filled the sexual organs. This absence, however, of all doubt, turns out after all to be a very doubtful matter indeed, or in other words, it was on the part of Mr. Huber a most decided blunder. With the view, however, of ascertaining the fact, and solving every doubt, respecting which he had previously declared, that no doubt whatever existed, he proceeded to the manufacture of a certain number of queens (of which art and mystery we shall

however, evident, after a clear examination of the description given by those naturalists, that they were in error, and that that, which they took for the seminal matter, was simply the fæces of her majesty.

treat hereafter) and they, being manufactured according to his wishes, he set them at liberty, in order that they might take an excursion into the woods, and, peradventure meet with a favorite drone. It is, *en passant*, by no means unworthy of remark, that the queens of Huber are the most pliant, docile, and accommodating of all creatures; they appear on every occasion to anticipate all his wishes, for upon whatever errand he despatches them, or whatever information he wishes to obtain from them, they never thwart nor disappoint him. The desired information, extravagant as it may turn out, is always immediately supplied —and it is found precisely to harmonize with his own preconceived opinion. In the present instance, the amours of the young queens were consummated in the upper regions of the air, and not as usual in the woods; although by what means Mr. Huber arrived at the knowledge of that fact, must now for ever remain a secret.

It was with the greatest anxiety that Mr. Huber awaited the return of the queens, and the first who arrived was immediately seized, and without having recourse to dissection spontaneously exhibited, what he was so very solicitous to behold. The substance, which presented itself to his delighted vision, was very thick and hard, very much resembling the matter in the vessels of the male, and very similar to it in colour and consistency. The belly of the queen was in constant motion, by alternate extension and contraction, and the cause of this phenomenon was of too great importance not to demand an immediate investigation —the queen was therefore doomed to undergo the operation of dissection. Happily, however, for her majesty, she rendered it unnecessary to have recourse to so desperate a measure, for she began to curve and twist her body in a most extraordinary manner, such as Mr. Huber affirms he never witnessed before in his life. The queen now

endeavoured to reach the extremity of her abdomen with her fore feet, and this motion was very sagaciously construed by Mr. Huber into a desire on the part of the queen to withdraw the substance, which was still appended to her tail. After pulling and tugging for a considerable time, the queen succeeded in disuniting the substance from the extremity of her abdomen, and it fell exactly where Mr. Huber wished it should fall, that is, it fell straight before him. He now expected to find a shapeless mass of coagulated fluid, but his surprise was boundless, when he discovered the interesting object which lay before him, to be nothing less than the genital organ of the male, that had rendered this queen a mother. But Huber very justly says, and we give him full credit for his assertion, that on this occasion he could not credit his own eyes; and he further declares, that this discovery of the genital organ of the male being found in the female, is a mystery which he will not pretend to solve; and his candour carries him so far as to admit, that when he is describing the retarded impregnation of the queen, he finds himself in a dilemma, from which he cannot extricate himself. It is, in fact, one of the principal features of Huber's theory, that the queen does not begin to lay her eggs until forty-six hours after impregnation; but from repeated experiments we are enabled positively to deny the truth of that statement. We will suppose a swarm to be newly settled, and the first inquiry then is, whether the queen, which accompanied that swarm, be the old queen of the parent hive, or one of the young queens of the season? It is the opinion of Huber, that it is the former, who always departs with the swarm; this is, however, at direct variance with our own experience, having had the same queen in a hive for four years, and whose wings we clipped for the express purpose of ascertaining the fact of the parent queen departing, according to the statement of Huber, with the first swarm.

Swammerdam proves, by repeated experiments, that it is the young queen who departs with the swarm; and he adduces one very cogent reason for it, which is, that at the time when the swarm departs, the old queen is so burdened with the weight of the eggs in her ovarium, that she cannot fly, or at least not to that distance to which a swarm sometimes extends its flight *. Huber, however, evidently foresaw, that if he made the young queen the leader of the swarm, it would go nearly to the breaking up of his system altogether. He saw the difficulty in which he would be involved, in regard to the impregnation of the young queen, and therefore, rather than meet that difficulty, he had recourse to the promulgation of the decided error, that it is the old queen who leaves the hive with the swarm.

Nevertheless, it is not long before he falls into his customary contradictions, for, according to one statement, it is the old queen who leads the swarm, and according to another, it is the young queen; but, then in the former case, the old queen is already fructified, but in the latter, it is the desire of the young queen to *be* fructified, which urges her to leave the hive; and on this occasion, she appears to be in such a violent agitation, amounting to a kind of delirium, that the sensation is, by some process, of the nature of which Huber declares himself ignorant, communicated to the common bees, and it continues to increase, until the queen pleases to betake herself off with the whole troop of her agitated subjects: and this may be considered as the programme of a swarm.

The statement of Huber, that the queen does not begin to

* Lombard says, "It is always the queen mother who departs with the first swarm. To accomplish this, however, it is necessary that she 'should be light,' and arrived at the point of the suspension of the laying of her eggs during the time that is required by the new swarm to construct their combs. But if a queen who is still laying her eggs, be made to enter by force an empty hive, she knows not where to deposit her eggs; they fall from her against her will, and are lost."

lay her eggs until forty-six hours after being settled in her new hive, is disproved by repeated experiments. We have, on various occasions, confined the bees, immediately on their being domiciled, and on the following day, a comb of from four to five inches long was distinguishable, in which the queen had begun to lay her eggs. On another occasion, about two hours after the settlement of the swarm, a heavy rain came on, which continued unremittingly for three days with such violence, that not a bee, much less a drone, could leave the hive. Fearing that the bees might be suffering from hunger, we supplied them with some food, and then took the opportunity of examining the combs, and found in the cells not only the eggs of common bees, but also of drones. Now, how were those eggs fecundated? With the disapproval of the conjecture that it is the parent queen who leaves the hive with the swarm, the question then presents itself, how and when was the virgin queen fecundated? Our own experiments prove that in several instances, she has laid her eggs without ever having left the hive; she must then at the time of her departure from the parent hive, have been in a fecundated state. But this is no where alleged by Huber, on the contrary, he affirms that the queen must take one of her aerial flights, before she can begin to lay her eggs. The act of coition could not have taken place in the hive, for this is said by Huber never to occur, and, therefore, unless the young queen was fecundated previously to her leaving the parent hive, the eggs must have been impregnated by some other process than that of coition. As the death of the drone is the consequence of the act of coition, it follows that if such an act had taken place during the confinement of the bees, the body of the drone would have been found on the pedestal, but no such occurrence took place.

We will most willingly award to Huber the benefit of the observations of other naturalists, who are decidedly in

favour of the sexual coition of the drone and the queen, although they are comparatively silent as to the manner in which it is accomplished. Thus, Mr. Anthony Humel of Laybach in the duchy of Carniola, a country celebrated for the culture of the bee, mentions that on the 23rd of June he had a swarm. On the following day, he remarked that the bees, as usual, took the air, and that the queen, having amused herself for some time amongst them, took to her wings; on which the whole community appeared restless and disturbed. In about half an hour afterwards, the queen returned, having a white substance on the exterior part of her body. The bees hurried after her with delight into the hive. On the 5th of July, he had another swarm, but the queen did not appear outside of the hive until three days afterwards; she flew for some time about the hive, as if she were reconnoitring, and then flew away. She returned in a short time, but without any alteration in her body. On the 10th, she took another excursion, and in about half an hour afterwards, she returned very weak, drawing her wings after her, and a whitish liquid at the extremity of her abdomen. The bees immediately fluttered their wings with joy!

In order to invalidate the above statement, it is merely necessary to make one remark. During the whole of our experience, we never knew a single instance in which eggs were not to be found in a hive forty-eight hours after the swarm having been settled in it. Now, according to Humel, the swarm left the parent hive on the 5th of July, evidently, according to his own statement, with an unfecundated queen. She remained tranquilly in the hive *for three days*, when she took one of her flights, but did not succeed in the accomplishment of the design for which she took the journey. On the 5th day, however, she takes another flight, and returns to the great joy of the bees, with the decided marks of fecundation. Thus, according to Humel,

we have a queen bee remaining in a hive five days in an unfecundated state, and therefore a certain time must elapse, from her fecundation to the deposition of the eggs in the cell. Now, the statement of Humel shows that it could not have been the old queen, who departed with the swarm, for were such the case, there would have been no occasion for her to leave the hive for the purpose of being fecundated, but she would have proceeded immediately to lay her eggs, having been fecundated previously to leaving the parent hive. If Mr. Humel had, however, examined his hive during the three first days in which the queen remained in it, he would have found both combs and eggs in a fecundated state, and yet according to his own showing, the queen was not fecundated until five days afterwards.

In a very scarce tract, written by Mons. Forlani, pastor of the Chapter of the Noble Sisters of Vinckendorf, he affirms that he has witnessed the same circumstances more than forty times in twenty-two years. He has remarked that the late swarms never entered the hive unless the queen was fecundated. He has frequently seen clusters of drones which fecundated the queen, fall to the ground, one of which was attached to her, as in the case of butterflies in general.

M. Forlani asserts that all his countrymen, whom he consulted on the subject, assured him that the same circumstances had often come under their notice, and that they consider it a good sign, when the queen leaves the hive at an early period for the purpose of being fecundated, which having taken place, she never leaves the hive again, whereas, before she was fecundated, she left the hive three times.

We shall make but a few remarks on these statements of Forlani, for in one particular, he has exceeded Huber, as he declares himself to have been an eye-witness of the copulation of the drone and the queen. But when and where did that act take place ? The words of Forlani are " *Souvent*

on voie tomber des pelotons des bourdons, qui fécondent la mère ; celle-ci est attachée à l'un d'eux, comme on le remarque chez les papillons." Now did this act take place externally or internally of the hive ? If the former, the statement of Huber cannot be correct; for according to him it is performed by a single drone, but whether inside or outside the hive, he does not mention. If it were performed interiorly of the hive, Huber cannot be correct again, for he declares that the copulation never takes place in the hive, and in regard to the latter point, all the advocates for the copulation of the queen and the drone, appear to agree. The circumstance of the queen being surrounded by a cluster of drones, is much against the act of copulation taking place in the open air, and as to a cluster of drones being seen in the hive, as M. Forlani has represented them, it could not have possibly been seen in the hive, generally in use in Carniola; and however skilful M. Forlani may have been in the management of his apiary, we know his countrymen to be as ignorant and besotted in the management of their bees, or the natural history of the insect, as a Siberian boor.

Mr. Huber once tantalized one of his queens by confining her for the long period of thirty-five days, during which time she had no communication whatever with the drones. In his relation, however, of this circumstance, he commits one of his usual inconsistencies ; for he says that he confined the queen by contracting the entrance of the hive, but that, nevertheless, the working bees and the drones could go about their respective labours and amusements. Now, Huber could not have been ignorant of the relative magnitude of the three species ; and therefore in what manner the entrance of the hive could be so contracted as to allow the egress of the drone, which is larger than the queen, and yet so diminutive as to prevent her leaving the hive, is a problem which Huber alone can solve.

On the thirty-sixth day, the queen was emancipated from

her imprisonment, and, consistently with the theory of Huber, she immediately took her flight in search of her paramour. She was seen to return with the infallible marks of sexual intercourse having taken place, and here commences another extraordinary feature in the natural history of this most wonderful insect. Huber discovers that if the impregnation be retarded, she then lays nothing but male eggs, or, in other words, that nothing but drones are bred in the hive; a circumstance, which we will venture to affirm never took place in any hive whatever, but that the whole statement is nothing more than one of the wild conceits of Huber's brain.

We will, however, proceed to examine this part of the system of Huber more minutely; for it is the early or late impregnation of the queen which forms the groundwork of his theory. It must be admitted, as an undeniable fact, that the ovarium of the queen, at the time of her departure from the hive with the swarm, is completely full of eggs in all the stages of their growth, from the almost perfect one, gradually dwindling to little points, almost imperceptible, and thence to a white viscous fluid, which may be considered as the germ of the future egg. The ovarium of the common fowl presents nearly the same phenomenon, and the hen will continue to lay her eggs even without any impregnation of the male, until her ovarium be wholly exhausted. Now, if we reason analogically, what becomes of the immense number of eggs, which were continually arriving at maturity, in the ovarium of the queen, during the thirty-five days of her imprisonment? Mr. Huber surely will not be so bold as to say that during the time of her confinement, the growth of those eggs was suspended, and that it was not until the thirty-sixth, when she sought the male in the open air, that any eggs were generated in her ovarium? According to this hypothesis, which is at variance with all analogy,

the intercourse with the male precedes the existence of the egg. This experiment of Huber, however, is defective in some of its most essential points. He does not inform us that he examined the queen at the moment of her incarceration, in order to determine the absence of any eggs in her ovarium ; and, further, he does not inform us that he daily examined the combs of the hive for the purpose of ascertaining the existence of any eggs in them ; but we are simply told that he confined her for thirty-five days, at the same time, by his own showing, she was so confined that she could leave the hive whenever she pleased. This experiment, therefore, of Huber, in regard to the retarded fecundation of the queen, and the vaunted discoveries consequent thereupon, literally go for nothing. We are supposed further to infer from the deductions of Huber, that during the whole period of the incarceration of the queen, the process of breeding was entirely suspended, and that if she had not obtained her liberty, no eggs would have been laid in the hive. Huber admits that she begins to oviposit forty-six hours after her impregnation, but then it is the eggs that are fecundated, and not her ovarium. Are we thence privileged to infer, that if she had not been fecundated, those eggs would not have been laid, or that they would have dropped from her body abortive ? In contradiction, however, of the statement of Huber, we affirm that the queen bee begins to lay her eggs as soon as there is a cell ready to receive them, and which is generally the case in twelve hours after the swarm has been settled in the hive, and certainly previously to her ever having left the hive for any purpose whatever.

To those who are the least acquainted with the internal economy of a hive, the following statement of Huber will be read with every token of surprise. During the whole of our experience, added to that of several individuals, celebrated for the depth and correctness of their researches

we are not able to adduce a single instance in which a queen bee was ever bred after the month of July, and even that itself is a direct phenomenon ; Huber, however, mentions an instance of a queen being born as late as the fourth of October, a circumstance unknown in the whole history of the bee, and the following experiment may be designated as one of the wildest of Huber's fictions. He says,—this queen was put into a leaf hive, in which a considerable number of males were still existing. By males we must suppose that he means drones, and when was a drone ever known to exist in a hive in the month of October ? The massacre of the drones always commences in the months of July and August, and frequently much earlier, the breeding season being then over, and the labours of the hive drawing to a close. In the year 1836 we had four hives, the drones of which were massacred in the month of June, but it must be observed that we had prevented the swarming of those hives. The queens, however, still continued to lay drone eggs as late as the beginning of August, but they were punctually murdered as soon as they made their appearance. No one but Huber, who in all his reports seems to set all truth at defiance, would have ventured to speak of the queen laying eggs, and of the existence of drones in the month of October, much less to make it the foundation of an experiment, the tendency of which is, to support his fallacious theory of a retarded impregnation.

Huber, however, proceeds to state that the queen, from the fourth of October to the thirty-first, made four-and-twenty fruitless attempts before she could obtain the fecundation of the drone, and being then twenty-seven days old, her fecundation had been retarded. Thus we have an instance recorded on the authority of "the prince of apiarians *," of a queen bee breeding in the beginning of

* So styled by a Mr. Watts, a writer in the Mechanics' Magazine, whom we challenged to produce a queen from a common egg, but he failed in

November; the drones actually existing for the purpose of fecundating her, and the whole process of ovipositing going on, as if it were the height of summer. The bees in England, Germany, and Switzerland are in the month of November already in their hibernating state, when scarcely a single bee is seen to leave the hive; and this fact being admitted, the whole statement of Huber is not entitled to the least consideration. Further, in accordance with the system of Huber, the queen ought to have commenced laying her eggs forty-six hours after the impregnation, but we are told that *the weather was too cold to admit of it.* The climax of this miracle is, however, yet to come. From the month of October until May she was confined by merely contracting the entrance, and during that time she had laid more than 3000 male eggs!! and 2438 common workers!!! If, however, we examine the latter part of this statement, to what conclusion are we necessarily driven? To no other than that Huber was decidedly ignorant of the natural history of the bee. When, in the first place, was it ever known that the queen bee laid her eggs in the winter? And secondly, when was it known that three thousand drones were ever bred in one hive? And supposing even that number to be bred, in what manner were they to be supported? Three thousand useless mouths in a hive, living upon the stores of the community, would soon exhaust their resources, and ultimately prove the destruction of their hive; and more especially so, as it would take place at a season of the year, when the bees had no means of replenishing the heavy drains, which would be daily made upon their magazines.

The system of retarded impregnation, is what may be styled the favourite hobby horse of Huber, and it must be admitted that he has ridden it unmercifully, in return for which it has thrown him into some very awkward predica-

twenty-three trials, excusing himself for the failure, by alleging, that his hives were deficient in royal jelly makers.

ments. From this system spring all the actions of the queen bee, and of her eccentric departure from those rules and habits, to which, in all other cases, she appears to be unerringly bound. In fact, the very species, which are to emanate from the egg, depend upon the period of her impregnation, and not on the sexual character inherent in the egg; independently of which, if the impregnation be retarded, it has the wonderful effect of so stultifying the queen, and so impairing her knowledge of the exact kind of egg which she is about to lay, that all is confusion and disorder. She lays drone eggs in common cells, and eggs of common workers in drone cells, and so great is her stupidity, that she actually lays male eggs in the royal cells.

It should, however, be further remarked, that the queen under no circumstances whatever, ever lays an egg in a royal cell, after it has once been vacated by its original tenant, when it becomes decidedly useless for every purpose in the hive. Retarded impregnation, may, according to Huber's experience, make a fool of the queen; but he admits at the same time, that some very proper limits are placed to her fooleries, Nevertheless, he certainly makes her guilty of a very great one, when he asserts that she lays male eggs in the royal cells; which eggs, we are informed by Huber, the bees at first take great care of, but then in three days, so precise is Huber in his reports, they very unceremoniously make a dainty meal of them. The latter affair, according to Huber's own confession, is an insoluble problem to him, for he declares that he cannot comprehend why the bees should take such great care of these male eggs in the royal cells, and then without any apparent concern or remorse determine to eat them. We confess that we are not less puzzled than Huber himself, to comprehend the fact itself, and we can only characterize it as one of those illusions, with which he was so often visited. His account, however, of the workers on this occasion, is exceeedingly amusing; at all events, it can lay

the most decided claim to originality; for, he says, the instinct of the workers appears in this instance to be defective, for they proceed to administer the royal jelly to the nymphs in the royal cell, and build up the cell, as if it were really a royal worm, yet notwithstanding all this care, the egg, in despite of the administration of the royal jelly, produces a drone, and the common bees then appear confounded and confused at the mistake which they have committed. In another place, we are told that the administration of this royal jelly is in itself of sufficient potency, to convert a common egg into a royal one, the issue of which shall be a queen. In the present instance, however, the royal jelly must have been of a spurious and adulterated kind, or it was not administered in such profusion or in so skilful a manner as to effect the metamorphosis, and, therefore, the egg remained intrinsically a drone egg, and the common bees might have spared themselves the trouble of administering any royal jelly at all.

There is another circumstance which disentitles the foregoing statement of Huber to the slightest credit. He affirms that the queen bee was confined to the hive, *by simply contracting the entrance* from October to May. Now how could this be effected without confining also the common bees, and more especially the drones; and would not such confinement be tantamount to the total ruin of the hive? The population, according to his own showing, has increased nearly six thousand in number, but all egress from the hive being prohibited, the community must necessarily be starved to death.

The disproportion of males to the females in a hive has from the earliest period, been a subject which has occupied the attention of all apiarians, and Mr. Huber in his first letter to Bonnet attempts to account for that circumstance, in the following manner;—"The naturalists," says Mr. Huber, "have always been very much embarrassed to

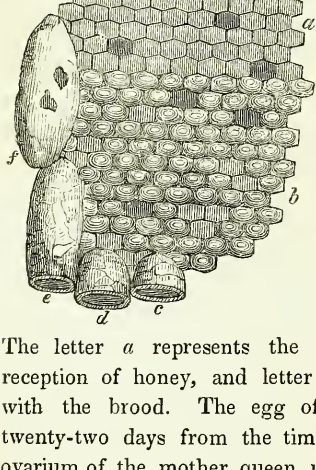
account for the number of drones which are found in the majority of hives, and which seem like a dead weight on the community of the bees, *as they do not perform any functions in the hive.* At the present day, however, the intention of nature in multiplying them to such an amount, may be ascertained, because *as the fecundation cannot take place in the hive,* and the queen is consequently obliged to take an excursion in the open air, for the purpose of meeting with a male who can fecundate her, it is necessary that these males should be so numerous that the queen may not experience any great difficulty in meeting with her paramour. If there were only one or two drones in a hive it might very probably happen that they would not leave the hive at the same time as the queen, or they might fail to encounter each other in their excursions, consequently, the majority of queens would be barren."

In regard to the young queens, it is certain that they never lay any eggs in the hive in which they were born, in fact, their greatest anxiety appears to be to get out of it as soon as possible, for they are perfectly conscious of their fate, if they remain in it*.

It must, however, be considered that Huber makes it an unconditional feature in the history of the queen bee, that it is the old queen who leaves the hive with the swarm, a fact which has been disproved not only by native, but by foreign apiarians. We have had the same queen in one hive for four consecutive years; and even the editor of the Naturalist's Library, in opposition to his great authority, acknowledges that he has had the same queen for three years. Some young queens are more precocious than others in the generation of eggs in their ovarium, and it is on that

* Miles asserts that two queens sometimes govern in the same hive, and that a large comb then forms the barrier between the two kingdoms. He would have been just as near the truth, had he placed two kings at once on the throne of England.

very circumstance, that depends the early or late departure of the young queen from the hive. It is, however, not a little extraordinary, considering the numerous circumstances which arise from the natural and invariable habits of the bee, and all of which have a direct tendency to disprove the statement of Huber, that he should have ventured to promulgate it so dogmatically, when the detection of its falsity is an every day occurrence in the management of an apiary.



The cell which is to serve as the cradle of the young queen is constructed on the verge of the middle combs, and in its shape resembles the cup of the acorn, only more contracted at the orifice. The figures *c d e f* represent the queen's cell from its commencement to its completion, when it in a great degree resembles the cocoon of the silkworm. The letter *a* represents the cells appropriated for the reception of honey, and letter *b* denotes the combs filled with the brood. The egg of the queen takes about twenty-two days from the time of its emission from the ovarium of the mother queen, until the insect arrives at its maturity. It has been supposed by some naturalists that there is no sexual difference in the egg, but merely in the mode of its fructification, and that instead of all the eggs being fructified by the drones, each is impregnated by its like; the drone by the drone, the common bee by the common bee, and the queen by herself; and in order to substantiate this hypothesis, some have decided that they have discovered males and females amongst the common bees.

When the queen lays an egg, she enters the cell retrogradely, and having deposited the egg, she withdraws, and hastens to another. The drones enter the cell in the same manner, and emit the seminal fluid, which fecundates the egg.

As an advocate of that particular system, we have had several difficulties proposed to us, and the apparently unsatisfactory manner in which they have been solved, arising from the acknowledged mystery in which the natural history of the bee is enveloped, has been the cause of triumph to the adherents of the copulating system. Notwithstanding, however, the assertions of many apiarians, which are said to be founded upon actual and repeated observation, it is certain that not a single drone is permitted to remain in the hive during the winter. We have frequently examined our hives, from the month of October to the middle or end of February, and never yet could find a single drone. Now here the first difficulty presents itself. In what manner are the eggs fructified in the spring, as there is not a single male to be found in the hive? The adherents of the system of coition assert, that, previously to the destruction of the drones in the autumn, they fructified the queen, and that she remains in that state until the spring. According, however, to that hypothesis, it is not the egg which is fructified, but the body of the queen; for in this case, how could the eggs be fructified, which were not in the ovarium of the queen at the time of the last coition with the drone? The difficulty, however, of the fructification of the egg in the cell, when there is no drone to be found in the hive, remains still to be solved. In order to arrive at the solution of this problem, we have reluctantly destroyed many fine hives, but not without many successful results. In the month of August, 1839, we observed one of our populous hives busily employed in the massacre of their drones, and we selected that hive on which to continue

our researches into this great secret of apiarian science. In a few days the work of slaughter had ceased, and we then "drove the hive *," in order to be convinced that no drone remained, and after an hour's strict examination, we had ascertained that not a single drone was in the hive. Leaving then the bees in the empty hive, we took the full one into the house, and began the examination of the combs. Our design in this instance was to discover some cells in which the egg was in that state, as if it had been just laid by the queen, and which might have been fructified by the drones previously to their expulsion. We were not long before we discovered the object of our search, and after cutting a small piece of the comb away, which contained the cells in which the eggs had been deposited, we returned the hive to its place, and restored the bees to it. We then proceeded to examine the eggs in the piece of comb, by the aid of a microscope, and we observed that they were glossy and full; there was not, however, any mucous matter in the cell, which could indicate the injection of the seminal matter by the drone. We conjectured however, that it might have been absorbed by the egg, previously to our examination. These eggs were deposited in the common hexagon cells, consequently, the common working bees were to be the produce. Our next aim was to discover if there were any eggs in the drone cells: and we again drove the hive—but the difficulty here was great, as the drones are always bred in the middle of the combs, and towards the upper part of the hive. To reach the

* As this expression will frequently occur in the course of this work, we mean by 'driving a hive,' the act of forcing the bees to leave their own hive and take refuge in another. This operation is performed by placing an empty hive over the full one, and by gently tapping the latter, the bees will ascend into the upper one, and the lower one then remains ready for experiments, or the purpose of deprivation. The above directions are, however, given on the supposition that the bees are in the common cottage hive.

drone cells we were therefore obliged to cut away a considerable part of the brood combs, and having satisfied ourselves that there were eggs in the cells, we left the hive to repose for a month. In November, another examination was instituted, but a very trifling alteration in the eggs had taken place. They had increased a little in size, but not a single cell was closed, from which any positive conclusion could be drawn that the process of generation was proceeding. During the whole of the winter, we examined the hive at stated periods, but perceived no visible alteration in the eggs. By the latter end of February, however, the whole of the eggs were hatched, and some drones were to be seen in the hive.

From these experiments we drew the following conclusions ;—that at the end of the season, fructified eggs exist in the brood combs, which, as heat is necessary to their growth through the different stages, cannot be hatched in the coldness of winter *, the warmth of the hive at that time not being sufficient to bring the eggs to maturity, and that as the warm weather declines, the hatching of the eggs also gradually declines, until it entirely ceases, awaiting the return of the spring.

When a queen bee has not a sufficient number of labourers to construct the cells which are necessary for the reception of her eggs, she will frequently forsake the hive, although it may be well stocked with provisions. In order to remedy this inconvenience, some empty combs should

* It was the opinion of M. Ducarne, a most able French naturalist, that the queen lays her eggs even in winter. He says, "Quelquefois même il fait assez doux dans l'hiver pour engager la reine à pondre, et à déposer quelques œufs, mais ces œufs ne pourroient éclore qu'après l'hiver, quand les abeilles iront aux champs leur chercher de la nourriture." From these statements of M. Ducarne, we are entitled to draw the conclusion, that it was his opinion that the queen was fecundated by the drones, previously to their expulsion. M. Ducarne would have thrown some valuable light on the natural history of the bee, had he informed us what sort of nourishment the bees collect in the fields, in order to expedite the hatching of the eggs.

be placed in the hive. The ancients adopted this method, and it was strongly recommended by Varro, and some of the more modern apiarians. A more simple and efficacious method has however been adopted, which is, instead of putting into the hive detached pieces of combs, to place under it the hive of a colony, the bees of which have died during the current year. The brood of this hive will hatch from the warmth of the bees, and thus the colony will be increased in numbers, and the queen receive an additional number of cells in which to lay her eggs.

We do not mean however to recommend this plan on general principles, as it is in its success so very uncertain; and so well are we acquainted with the character of the queen bee, as to know, that when once she has determined to leave the hive, it is no human skill nor device which can retain her. On one occasion, a queen bee left her hive, taking with her all her subjects: we returned her eight times to the hive, adopting every expedient which our experience could devise to induce her to remain, but she had made up her mind to go, and go she did, leaving us in entire ignorance of her ultimate destiny. A similar circumstance occurred to a swarm which we had in the year 1838. We had hived the swarm, as we supposed successfully, when on a sudden, we observed the bees rushing out of the hive, and, taking to their wings, settle on a goose-berry bush. Again we hived it, and again the bees left the hive. Again and again we hived them, but the bees would not stop. We therefore conjectured that the queen might have been lost, and we carefully examined the swarm, when the mystery was at once solved. There were two queens in the swarm, and one of them, knowing that she was an intruder, determined to take a certain number of bees with her to found a colony of her own. We reluctantly killed one of the queens, and the bees afterwards remained quietly in their hive.

In Pliny, and almost all the ancient writers, the queen

is always spoken of as the king, and it was the generally received opinion, that he had no sting. It is, however, certain that the queen bee has a sting, although she seldom makes use of it. A French naturalist, M. La Grenée, says that he held a queen bee in his hand for some length of time, and even teazed her, without having had the honour of being stung. We have always been averse from provoking the queen bee to sting, as the consequence of such an act would most probably be the loss of the hive.

This apathy or reluctance on the part of the queen to act on the defensive, or to revenge an affront, which is so very conspicuous in the common bee, arises entirely from a powerful natural instinct, and a consciousness which she possesses, that the welfare of the hive depends wholly on her preservation. The monarchy would be exposed to many frequent and alarming dangers, were she addicted to the same ebullitions of irascibility, and inflicted her sting on the least act of provocation, which is so observable with the common bee. She is the soul of the hive: if she perish, the labours of the monarchy cease, and the bees immediately forsake their domicile. This is in itself a very cogent reason why she is not fructified *à la Huber*, for were she in the habit of leaving the hive, for the purpose of copulation with the drones, she would have to encounter such a host of enemies, who are ever on the alert for the bees, that her safe return to the hive would become a matter highly problematical.

The attachment of the bees to their queen can only be equalled by the importance which they attach to her welfare —without her, the community would disperse, and be annihilated; without her, or at least without the hope of another being soon born, everything would be in languor, dejection, and consternation. The bees would immediately leave the hive, and become a horde of vagabonds, when they would fall a prey either to their enemies, or die from

the excess of their chagrin and sorrow. If the queen forsake her dwelling, whether it be that it is not sufficiently commodious for her, or that the combs have been spoiled, or that it has been attacked by other insects, they still follow her with an unshaken constancy and fidelity, and repair with her to the spot, which she may have chosen for their future domicile.

Essentially necessary, however, as she is to the monarchy, she is not burdened with the government, nor with the police, nor the administration of the laws. Each bee performs that part which the good of the community requires, and it is never known to neglect its duty. The intimation of any order is useless, or the prescription of any particular kind of labour; hence that regular distribution of employment—that individual display of talent—that vigilance and foresight, which have been attributed to the bees by Huber and other fabulists, may amuse the votaries of fiction and romance, but, as being inconsistent with truth, ought to be exploded from the natural history of the bee.

According to Huber, the act of laying the eggs by the queen, is a kind of state ceremony; for he informs us that when she proceeds to the discharge of that important part of her duty, she is regularly attended by ten or twelve working bees, as a kind of body-guard, some preceding her, some following her, some respectfully offering her a little honey to refresh her, others kindly licking her with their proboscis, whilst others cleanse her majesty of all impurities, which may have gathered about her royal person by the frequent introduction of her body into the cells. Having arrived at a particular cell, she thrusts her head into it, in which attitude she remains for some moments, but for what purpose, Huber professes his ignorance; but no doubt whatever exists, that it is to ascertain, if there be already an egg in the cell. The guards then assist her in withdrawing from the cell, by pulling her majesty by the hinder legs,

and on being wholly extricated, she then thrusts her other extremity into the cell, which Huber, perhaps very justly, considers to be done for the purpose of depositing an egg. After having performed this operation five or six times, her majesty becomes so fatigued that she is obliged to rest, when the guards show her every requisite attention, until her majesty be sufficiently recovered to prosecute her labours.

We may, perhaps, be accused of throwing an air of ridicule over the foregoing statement, but we consider ourselves fully warranted in so doing; for when we meet with an individual, who attempts to impose upon us with a series of incredible fictions as the results of ocular experience, and who in his statements sets all reason and common sense at defiance, calling upon us at the same time with a dogmatical voice to subscribe our belief to those statements, disproved and falsified as they are by the commonest tests of experience, we then deem such an individual to be a subject fit only for the lash of ridicule; and the more severely it is applied, the greater is the service done to the cause of truth.

Disposed, however, as we may be to treat the statements of Huber with that severity of ridicule which they so richly merit, we feel still more inclined to exhaust our powers of castigation upon the statements of those individuals, who, relying upon the belief which has been so extravagantly awarded to the discoveries of Huber, have attempted to earn for themselves an equal degree of credit by the dissemination of facts, pretending to be the result of ocular experience, but which, we confidently assert, no apiarian ever did, ever could, or ever will see. We allude in particular to the statements promulgated by the editors of the Insect Architecture in the volumes of the Society for the Diffusion of Useful Knowledge, and in the Naturalists' Library, in the latter of which, Mr. Duncan has in many instances actually out-huber'd Huber in the falsity and

absurdity of his statements, and thereby in a great degree depreciated the general value of his discoveries. It is, however, not a little singular that, in numerous cases, Mr. Duncan clearly perceives the absurdity of Huber's statements: he acknowledges that they are at variance with all credibility, and that they require to be confirmed, before they can be admitted as positive facts into the natural history of the bee. With this conviction on his mind, we cannot refrain from expressing our surprise, that he should have been so frequently led away into the commission of the same inconsistencies and contradictions, which abound in the pages of Huber, and which excite in us the suspicion, that Mr. Duncan is not a true practical apiarian, but that his work has been compiled from the crude and undigested theories of visionary naturalists. In confirmation of the truth of the foregoing remarks, we have only to consult Mr. Duncan on the manner in which the queen lays her eggs, and on referring to page 61 we read, "In the operation of laying, which we have *a thousand times* witnessed, the queen puts her head into a cell, and remains in that position a second or two, as if to ascertain whether it is in a fit state to receive the deposit. She then withdraws her head, *curves her body downwards,* inserts her abdomen into the cell, and *turns half round on herself;* having kept this position for a few seconds, she withdraws her body, having in the meantime laid an egg. The egg itself, *which is attached to the bottom of the cell by a glutinous matter* with which it is imbued, is of a slender, oval shape, slightly curved, rather more pointed in the lower end than in the other." Now, with the exception of the queen *turning half round on her body,* which must have a truly pantomimic effect, but which is in truth nothing more nor less than a genuine Huberian illusion, incomprehensible, however, to every one in the least acquainted with the structure of a cell, the

foregoing description of the queen laying her eggs, and the position of them in the cell, are strictly conformable with truth, but if we proceed a little further, we find our attention drawn to the following contradictory statement: "*The eggs* (page 77), *when laid, remain fixed on the superior angle of the cell, to which they are attached by a viscous matter, covering them for three days; on the fourth, the shell or thin enveloping membrane bursts, and a small lively worm is deposited at the bottom.*" Now of the foregoing statement not a tittle is true: the egg is *never* attached to the superior angle of the cell, but is invariably deposited at the bottom. We, however, would ask, how are the uninitiated, amidst these conflicting statements, to arrive at the positive truth? They may indeed have recourse to experiment in order to decide the question; but still this does not absolve Mr. Duncan, who professes to be an apiarian, from that merited censure which is justly his due, who by his contradictions leads the scholar astray, and, instead of instructing, confounds and puzzles him.

To disabuse the uninitiated mind of the numerous errors disseminated by Huber and his adherents, relative to the deposition of the eggs of the queen, would far exceed the limits of the present work; and, in fact, it must be acknowledged, that there is not any part of the whole theory of Huber in which those errors are more glaring and abundant, than when he treats of what he is pleased to call the retarded impregnation of the queen, for it is from that circumstance that is made to result all the confusion, all the blunders and eccentricities which the queen bee commits, the whole of which are attended with such miraculous doings, as to set all credibility at defiance. It becomes, however, a matter of very serious regret, that nearly in the middle of the nineteenth century, individuals can be found, professing to be men of science and experience, who can co-operate in the perpetuation of the pretended

discoveries of Huber, and who can still uphold them as the result of direct experimental knowledge. For our own part, we hold the retarded impregnation of Huber as one of the most irrational, deceptive, and visionary portions of his theory, and in the investigation of it, Huber may with the greatest regard to truth declare, that he finds himself in an abyss in which he is lost. To those, who are in the least acquainted with the internal economy of a hive, can anything be imparted to them more fraught with error than the following statement, as sent forth by Huber, and acknowledged by his disciples to be true?—"In the *natural* state of things, that is, where fecundation has not been postponed, the queen lays the eggs of workers *in forty-six hours after her union with the male*, and continues for the subsequent eleven months to produce these alone, and *it is only after this period that a considerable laying of the eggs of drones commences.* These male eggs require eleven months to arrive at maturity, but *under the effects of retardation, they are matured in forty-six hours.* This period of eleven months includes the time that the ovipositing of the queen is suspended by the frost, and it is always proportionate *to the subsistence which the bees can find in the fields.* About the eleventh month, which in our climate arrives in March or April, the queens, heavy and big, *begin to lay male eggs;* twenty days afterwards the working bees construct the royal cells, in which the queens without discontinuing the laying of the male eggs, deposit, at the interval of one, two, or three days, those eggs from which the queens are successively to spring. The eggs of workers, which in the usual state of things would have been laid first, never come to light; *their vitality has been destroyed by some vitiation which has taken place, and the cause of which has not yet been discovered.*"—Well, indeed, may Huber say, that in contemplating the difficulties attending this subject, he finds himself in an abyss in which he is

lost; and we should not have been inclined to molest him in his dilemma, had he not so well succeeded in dragging a number of adherents after him into the same predicament, in which they obstinately close their eyes to the true effects of experience, and prefer to grope about in the chilling gloom of error and prejudice, rather than recreate themselves in the beneficial and glorious light of truth. We will, however, enter into a brief analysis of the foregoing statements of Huber; and, in the first place, we find it asserted, that the queen lays the eggs of workers in forty-six hours after her union with the male, and continues to lay them for the subsequent eleven months. Now that same act of union with the male takes place, according to Huber, in the open air, the period of which can never be ascertained; for although Huber pretends in one instance to have witnessed the queen on her return from her amours, yet he confesses, shortly afterwards, that what he did witness was a direct illusion. Huber is, however, able to determine the precise period, namely, forty-six hours, when the queen commences the laying of her eggs after the union; but as the precise moment of that union never has been observed, nor ever can be observed, the calculation of any event depending upon it must be a mere matter of speculation, and totally bereft of any value as an accredited fact. In the second place, the queen continues to lay the eggs of workers only for eleven consecutive months, and then commences the laying of the drone eggs. A more erroneous statement than the foregoing never was hazarded. We cannot suppose for a moment that either Huber or any of his commentators ever undertook the examination of the ovarium of a queen bee who had just departed with a swarm, or they would not have compromised their character as apiarians by the promulgation of such manifest errors. When, in the first place, was it ever known, that the queen bee laid her eggs for eleven consecutive months? The earliest period for the laying of

her eggs is the month of January, and the massacre of the drones is a direct indication that the breeding season is drawing to a close. This massacre begins to take place in June, and closes in August at the farthest, thus allowing seven or eight months for the breeding season; but never was it known in this country, nor even in that of Huber, much less in that of Duncan, that the queen laid her eggs in November. Thus the eleven consecutive months of Huber can only be looked upon as a fabulous delusion. Further, we are informed, that it is not until after the expiration of the eleven months, that the queen commences to lay drone eggs. In direct contradiction of which we can affirm, that a queen bee generally lays drone eggs, if the swarm be an early one, in fourteen days after taking possession of the hive: in fact, Huber himself acknowledges that the queen will lay fifty or sixty drone eggs during the summer; but so far from regarding it as a mere casualty, we affirm it to be an invariable habit of the insect, and we are warranted in that affirmation by the fact, that we never examined the ovarium of a young queen at the head of a swarm, without perceiving the rudiments of drone eggs in it. If we proceed further in the statements of Huber, we find that the male eggs require eleven months to attain to maturity. Is it possible for a more vicious error to be propagated respecting the drone eggs of the queen? But then we meet with a qualification, which goes to show that under the effects of retardation they are matured in forty-six hours. We, however, profess our incompetency to understand the meaning of Huber. Does he mean to assert, that the drone eggs take eleven months to come to maturity in the ovarium of the queen, or in the cell after their deposition? Let us, however, take whichever of the two cases we please, in either instance we find ourselves, like Huber himself, in an abyss of mysticism and error. To affirm that the drone eggs, under any circumstances whatever, take eleven months to arrive at

maturity, is at direct variance with the commonest results of experience; and, in fact, Huber himself had some lurking idea that he had sent forth a most preposterous error into the world, for he subsequently attempts to extricate himself from the predicament in which he had involved himself, by the qualification, that the queen bee must be eleven months old, before she commences the *great* laying of drone eggs, thereby disseminating one manifest error, in order to bolster up another. In vain do we look in the pages of Huber for any direct and positive information relative to the natural habits of the queen bee, for contradiction follows so closely upon contradiction, that truth becomes wholly disguised; and instead of reaping instruction, we have only the choice left us of deciding between a series of errors, each more incredible and preposterous than the other. Huber, however, would not have it for a moment believed that his own invention has any share whatever in the creation of all this falsity and confusion, but he attributes the whole to a natural cause, *viz.* retarded impregnation, the effects of which are of a truly serious nature to the queen bee. It is not sufficient that her physical powers become completely disorganized, but her intellects become also wofully impaired; and, by degrees, she exhibits herself so stultified, that she knows not what she is doing, running about at random, depositing drone eggs in common cells, and common eggs in drone cells; and, in the end, her whole nature becomes so metamorphosed, that nothing rational nor consistent is to be expected from her. This stultification of the queen is in fact a most convenient loophole for Huber to creep through, for had he not invented it, his whole system would have fallen to pieces. Still there are not a few, and their number is daily increasing, who look upon this stultification of the queen as a ridiculous fable; and that, instead of attaching that frailty to the queen, it ought to be alleged against those who have accused her of it.

The deeper, however, that we investigate the miraculous effects of retarded impregnation, the more profoundly are we struck with wonder at the incalculable extent of the inventive powers of Huber, as well as at the unfathomable credulity of those, who can lend their sanction to such a series of palpable fictions. If Huber had gone no further towards the accomplishment of the complete disorganization of the interior economy of a hive, than what is contained in his account of the drone eggs, when laid by the queen in her unnatural state of a retarded impregnation, he would have done quite sufficient to show us, that it is one of the greatest calamities which can befal a hive; but the effects of that dire event fall not only on the drone eggs, but we are gravely told that not a single egg of the workers ever comes to light; *their vitality has been destroyed by some vitiation which has taken place, and the cause of which,* Huber justly says, *has not yet been discovered,*—and we may add, never will; for how can that be discovered, which has no existence at all? To sum up the whole:—the protracted maturity of the drone eggs, and the vitiation of the eggs of the workers, as being the results of a retarded impregnation, may amuse the credulous, and with some minds exalt the fame of the discoverer of such a wonderful trait in the natural character of the queen bee; but, in regard to actual truth, they both stand upon the same basis. Fiction was its architect, and the superstructure completed by ignorance. Correctly did Mr. Latreille speak, when he said, "*Je regarde l'impregnation retardée d'Huber, comme une de ses illusions infortunées, et qu'on ne doit jamais le recevoir dans l'histoire naturelle des abeilles.*"

THIRD CHAPTER.

THE DRONES.

MAKE OF THE DRONE—NUMBER OF DRONES IN A HIVE—ORGANIC STRUCTURE OF THE DRONE—OFFICE OF THE DRONES—OPINION OF L'ABBÉ DELLA ROCCA—TWO SPECIES OF DRONES, ACCORDING TO REAUMUR AND DEBRAW—HUBER ASSERTS THE EXISTENCE OF LARGE AND LITTLE DRONES—DEFICIENCY OF DRONES IN A HIVE—METHOD OF REMEDYING THE DEFECT—PROOF OF THE VERITY OF THE EXPERIMENT—THE DRONE DIES AFTER COPULATION, ACCORDING TO REAUMUR—EXPERIMENT OF MR. REAUMUR—THE ACT OF COPULATION OF THE QUEEN AND THE DRONE—TIMIDITY OF THE QUEEN BEE—QUESTION BETWEEN L'ABBÉ DELLA ROCCA AND MR. REAUMUR—DRONES ALWAYS EMIGRATE WITH THE SWARMS—FEW DRONES TO BE FOUND IN A SECOND SWARM—TRAGICAL END OF THE DRONES—ATTACK ON THE DRONES BY THE COMMON BEES—PERIOD OF THE MASSACRE OF THE DRONES—THE MASSACRE OF THE DRONES INJURIOUS TO THE BEES—ASSISTANCE TO BE GRANTED TO THE BEES—VARIOUS OPINIONS OF NATURALISTS AS TO THE MANNER IN WHICH THE DRONE IS KILLED—SUPPOSED TO BE BY THE STING—REFUTATION OF THAT HYPOTHESIS—COMPARISON BETWEEN THE BEE AND THE WASP IN REGARD TO THEIR STING—OPINION OF L'ABBÉ DELLA ROCCA—ANALYSIS OF THAT OPINION—HYPOTHESIS OF HUBER—HIS CONTRADICTIONS AND INCONSISTENCIES—EXAMINATION AND REFUTATION OF THE HYPOTHESIS OF HUBER—HUBER'S DISCOVERIES NOT THE RESULT OF HIS OWN OBSERVATIONS—HIS PHYSICAL INFIRMITY—FRANÇOIS BEURNENS, THE DOMESTIC OF HUBER—HIS CHARACTER—PREJUDICES AND SUPERSTITION—MR. RENNIE AND MR. HUNTER—ERROR OF MR. HUNTER—THE BEES ACCORDING TO HUNTER, DEPOSIT THEIR EXCREMENT IN THE CELLS—REFUTATION OF THAT STATEMENT—THE RETENTION OF THE FÆCES INJURIOUS TO THE BEES—HUBER'S HYPOTHESIS ON THE STING OF THE BEE—DR. HOWISON'S OPINION OF THE METHOD OF KILLING THE DRONES—NOT MENTIONED BY ANY NATIVE OR FOREIGN APIARIANS—QUOTATION FROM LEVETT (NOTE)—EXPERIMENT TRIED IN THE PRESENCE OF BONNER AND OTHER NATURALISTS—STATEMENT OF MR. PUDDECOMBE (NOTE)—FINAL EXAMINATION OF THE SUBJECT.

It is easy to distinguish the drone from the other inmates of the hive. In his body, he is rather shorter than the queen, but more round and bulky. When he departs from or enters the hive, he always announces his presence by a loud humming noise, from which he derives his name.

The number of drones in a hive is very indefinite: in some hives there are four or five hundred, in others from eight hundred to a thousand. Their number, however, is always in proportion to the fecundity of the queen and the number of working bees.

The drone has no offensive weapon like the working bee: at the place where the sting of the latter presents itself, is situated the orifice of the case which encloses the organ of generation, destined to the fecundation of the eggs of the queen.

The antennæ of the drones have eleven articulations, whilst those of the common bee have fifteen. Their eyes, constructed with the *rete mirabile*, cover the whole of the upper part of the head, whereas the eye of the common bee forms on each side a kind of oval. Their teeth are smaller than those of the common bee, nor are they required for the same purposes. Their proboscis is shorter and more slender, for as they never gather any honey from the flowers, but live entirely upon the stock of the hive, nature has simply furnished them with the means of imbibing the honey from the cells. Their proboscis would not be sufficiently long to extract the juices from the nectarium of the flowers, which, in some cases, lies at too great a depth, as in the case of red clover, even for the proboscis of the common bee to reach. The drone bee may be said to present the extraordinary phenomenon in nature, of a creature arrived at full maturity, and unable to procure the necessary means of its subsistence. The drones have no triangular cavities on their legs, in which to collect the farina; in fact, they appear by nature to be exempt from all kinds of labour, she having refused to them every instrument requisite for it; their life appears to be one of luxury and amusement, their only occupation being the fecundation of the eggs of the queen *, although it is asserted

* In a work entitled, *Praktische Oekonomische Abhandlung von der Bienenzucht, von Ladislaus Reichsedlen von Stoixner*, printed at Nürnburg in 1789,

by some naturalists, that a part of their office is the hatching and rearing of the young brood. It is not to be doubted that they promote that operation by the increased heat which their presence occasions in the hive; but how then is it performed, when there is not a single drone in the hive, that is, at the commencement of the breeding season? It must also be supposed that this co-operating power was more necessary at that period than at any other, when the exterior state of the atmosphere is not of such a temperature as to be favorable to the hatching of the young brood. It is, however, consistent with experience, that the drones are always to be found in the immediate vicinity of those combs which are filled with brood; but we are inclined to believe, under those circumstances, that their presence in that particular quarter has no immediate relation to the distinct occupation of hatching the brood, analogous to that of the male pigeon in the office of incubation, but that they frequent those combs only, as it is there, and in no other part of the hive, that the queen deposits her eggs, and, consequently, that their presence is not required in any other place. This opinion of the occupation of the drone is of a very remote date, for we find in an anonymous work, printed in 1572, that the drones are there called *brooding bees*, and Jacobi, a German author, in 1784, calls them *hatching fathers*.

The Abbé della Rocca, who in all matters relative to the bee has an undoubted claim to our attention, is an advocate for the system of the drones being brooding bees; but he qualifies his opinion by saying, that he does not consider this function to belong so exclusively to those insects, but that, in the absence of them, the bees can execute it equally as well. This, however, we believe to be one of the most unanswerable arguments against the hypothesis; for nature

the drones are called *Röhrmeister* or *Brunnenknechte*, which may be translated water-carriers, and the occupation of these insects is supposed by this visionary author to be the conveying of water into the hive.

is by far too systematic in her operations to endow an insect with a certain faculty, on which the continuation of its species depends, and yet, that the increase of its species will still proceed, whether that faculty be put in execution or not. No faculty whatever is given to animals, nor to insects, which has not some positive relation to their support or propagation, otherwise there would be a direct waste of power, which is a complete denial of the wisdom and goodness of the Creator.

It was the opinion of Reaumur and Debraw, that there were two species of drones in the same hive, some large and others smaller, the latter, however, preponderating in number. According to the former naturalist, the destination of the former was to be the fathers of the queens, and the drones of the first class, and the latter to be the parents of the common bees, as well as the drones of their own species. Huber has also asserted the existence of large and little drones, but not knowing in what particular department of the hive to employ the latter, he wisely conjectured that they were a kind of abortion, which the community of the bees got rid of, as soon as an opportunity presented itself.

If by any accident or untoward event, a hive be deficient in drones, the fecundation of the eggs of the queen does not take place, and consequently no swarms are produced. Whenever this is proved to be the case, the adoption of the following plan will be found of great service. Watch at the entrance of one of your most populous hives, from the hours of eleven to two, being the usual time when the drones take their periodical flight, and as they come out or return, catch about thirty or forty of them, and not having any sting, no danger awaits this operation : confine them in a bottle, or other close vessel, until the evening, when they may be introduced to their new habitation. The hive will most readily receive them, the eggs will be fecundated, and, if at an early season of the year, a good swarm may be expected.

We had once an excellent opportunity of testing the benefit of the foregoing experiment. Walking one day in the fields contiguous to our house, in the month of October, our surprise was great to observe a flight of bees passing at a short distance from us. We knew that it could not be a natural or regular swarm, as the drones in all our hives had long since been killed, and no doubt could be entertained that the same circumstance had taken place in other apiaries. We were therefore convinced that they were some bees, which from some particular circumstances had forsaken their dwelling. It was with great satisfaction that we saw the welcome strangers alight in a body, and hastening home for a hive, we were soon in possession of our unexpected treasure. Our difficulties, however, were now only at their commencement, for in what manner were our new guests to be supported through the winter? Unfortunately, we had not then in our possession a hive filled with combs, and the season was too far advanced to expect that any combs could be then constructed. By indefatigable attention we were enabled to preserve the bees throughout the winter, and in the spring some combs were constructed. On taking possession of the bees in October, not a single drone was to be found, and we consequently despaired of obtaining any swarms from it. We therefore determined to have recourse to the experiment already stated, and our labours were eventually crowned with success : we introduced about fifty drones, the eggs of the queen were fecundated, and we obtained two swarms from our hive in the course of the summer. We would, however, advise the person undertaking this experiment, to move the hive, into which he introduces the drones, to some little distance from his apiary, as the drones in their flight on the following day will be apt to return to their parent hive.

Considering the high and well deserved reputation which Mr. Reaumur enjoys as a naturalist, we cannot refrain

expressing our surprise, that he should have advanced so singular a doctrine, as that the drone, like the moth of the silkworm, dies immediately after copulation *. Had he advanced this untenable hypothesis on his mere conjecture, we should have been induced to ascribe it to a redundancy of fancy; but that he should assert it as the result of ocular demonstration, authorizes us to call in question his skill and knowledge as an apiarian. We know that Huber also entertained this opinion, and in our analysis of his system in a subsequent part of this work, we shall enter more fully into a detail of the alleged death of the drone after copulation; but, in the mean time, we doubt not that the following romantic story of the amours of the queen bee and her favourite drone, as witnessed and related by Mr. Reaumur, will be perused by every keeper of bees with great interest, leaving every one to attach his belief to that part of it which may have fallen within his own experience.

"I enclosed," says Mr. Reaumur, for we will translate the whole passage freely, "a young queen with a drone in a glass vessel. I saw with surprise, that for all the civility and kindness which the common bees entertain for the queen, she in return testifies the same for the drone. She caressed him first with her proboscis, then with her feet, as she walked round him, offering him at the same time some honey †. The drone bore all these dalliances in the most stupid

* We find this opinion also advanced in *der Oesterreichische Bienen-Meister, oder vollständiger in Gestalt eines Katechismus abgefasster Unterricht in der Bienenzucht, von J. M. O. Müller*, printed at Vienna in 1783.

† Mr. Reaumur is not singular in having viewed this phenomenon. Joseph Pössl, in his *Praktischer Bienen Katechismus für das Landvolk, und Bienenfreunde*, printed at München in 1787, also mentions that the queen mounts upon the back of the drone, and that she is often obliged to caress the sluggish drone before his passions can be excited, and sometimes even to feed him. This author asserts, that he has *often viewed the process of coition*. We consider it, however, as the mere repetition of the vagaries of former authors, and which are now repeated, in the works of the Society for the Diffusion of Useful Knowledge, as well as in the Naturalists' Library, with all the confidence of demonstrative experience.

manner. In the interval of a quarter of an hour he appeared, however, to be a little more animated; and when the queen, placed opposite to him, had with her feet pressed the head of this insensible drone, and had played gently with his antennæ, he at length determined to return her advances, by others of the same nature. By these passionate preludes, the queen at last excited the amorous desire of her indolent spouse, who became more and more sprightly and active. I perceived distinctly that a part of the interior organs projected from the drone. This endearing behaviour lasted for two or three hours, during which time they often rested, and then returned to their amours. At last, the drone took rather a longer sleep than was agreeable to her majesty, and she used her utmost exertions to awaken him from his lethargy; she teased him—she pawed—she bit him—she coaxed him; all was in vain, *the drone was dead !!!*

"This is not the only insect," continues Mr. Reaumur, "which perishes at this critical moment. I employed my best endeavours to console the widow; I gave her another husband, young and full of vigour; but, to my great surprise, she remained the whole of the day attached and weeping over the corpse of her spouse. On the following day, the corpse was removed, and a new husband presented to the queen, to whom she behaved with greater civility than to the former. A single night was sufficient to make this Artemisa forget the mausoleum of her deceased monarch."

Travellers are proverbially noted for telling marvellous stories, and they do so often without the fear of being detected, as centuries may elapse before another person travels over the same ground; but the naturalist, who wishes to establish his reputation for the accuracy of his observation, the depth of his researches, or the profundity of his scientific knowledge, should be cautious how he advances facts, pretended to be grounded on actual observation, the verity or

fallacy of which, however, can be proved perhaps on the following day.

We will venture to assert in the most positive terms, and we are privileged to do it by above thirty years' experience in bees, that no person ever yet beheld the act of copulation performed by the queen bee and the drone. Even Huber, in the wildest bounds of his imagination, never ventured to impose upon us the fiction that he had actually witnessed the act of coition, although he has *seen* the queen return from her amours with the drone in the open air, bringing with her his genital organ. Had we no other data on which to discredit the relation of Reaumur, the very nature and disposition of the queen bee would be in itself sufficient to invalidate the whole of his statement. A more shy, timorous insect, perhaps does not exist in the whole animal kingdom than the queen bee; and so far from allowing any one to be the spectator of her amours, or even of the most insignificant of her actions, and especially under a glass vessel, she will adopt every possible means to conceal herself, and shun the glance of an intrusive eye. There appears to be almost an impenetrable veil spread over all the actions of that extraordinary insect, and it is that very mystery which renders the study of the bee so interesting, and at the same time so very difficult.

When a hive swarms, a number of drones always follow the emigrants, in the proportion of the number of the working bees, for the purpose of fecundating the eggs of the young queen during the remainder of the season. A very few drones are to be found in a second swarm: in fact, we had once a second swarm, in which not a single drone was to be seen; but this hive did not survive the winter, nor, as far as we could ascertain, did the young queen ever lay an egg in the hive. Were the drones aware of her sterility, and therefore did not think it worth their while to follow her?

It now remains for us to describe their tragical end. When the queen has exhausted her ovarium, and the laying of eggs has ceased for the season, the common bees declare war against the drones, and during three or four days the most cruel massacre continues. Although by their make the drones seem to possess a physical superiority over the bees, yet they appear so conscious of the fate that inevitably attends them, that they offer not the slightest resistance to the attack, but attempt to save themselves, if possible, by flight. Three or four bees attack the drone at the same moment, and leave him not until life be wholly extinct in him. The whole sex must be annihilated, and the bees partake of no rest until it be accomplished. During this period of carnage, the front of the hives is a scene of strife and murder, and the ground before them like the field of battle, strewn with the bodies of the dead. In some hives, this carnage takes place at an early period, about the latter end of June; in others, it is postponed until August; but the exact period depends entirely upon the total evacuation of the ovarium of the queen.

Huber says that he has seen drones in a hive in January, and Mr. Duncan supposes that they were allowed to remain in the hive on account of the additional heat which they would generate in winter, or perhaps they may be preserved for the purpose of pairing with a new queen. Those suppositions, however, of Mr. Duncan have not a tittle of truth to stand upon; not a drone was ever seen in a hive in January; and as to the generation of heat in the winter, it would rather be a disadvantage than a benefit. The circumstance of the drones being preserved for the purpose of pairing with a new queen is a true Huberian crotchet, and unworthy of the acquiescence of any one in the least conversant with the interior economy of a hive.

The state of agitation and inquietude in which the bees are placed at the time of the massacre of the drones, obstructs

them greatly in their daily labour, and consequently, a great quantity of honey is lost which would have been amassed during that period. We are therefore of opinion, that the bees should be assisted in this undertaking, by the apiarian watching at the entrance of the hive, and with a small spatula killing every drone which appears. The disciples of Huber cannot object to follow this advice; for as, according to their preceptor, one drone is quite sufficient to fructify a queen for two or three years, no danger can occur to the hive by a gratuitous assistance in the killing of the drones, unless perchance they kill the favourite one, which the queen may have selected as her paramour.

It is the opinion of some naturalists, that the bee kills the drone by means of his sting; and in order to account for the circumstance of the bee not leaving his sting in the drone, and consequently committing a suicidal act, they pretend that the scaly cuticle of the drones is so very delicate, that the bees can extract their stings without the usual consequence of death. This is really begging the question, for, certainly, no one will dispute the proportion of delicacy or the fineness of texture between the cuticle of the drone and the epidermis of the human frame; but in the many hundred times in which we have witnessed the destruction of the drones, we never yet observed that the bee made use of his sting: we have invariably observed, that they attack the drone at the root of the wing, in the same manner as they do a wasp, or a pillaging bee. In all cases in which we have examined a murdered drone, we have found that the roots of the wings have been, as it were, nibbled away, and which accounts for the wings being almost always in a perpendicular position. The drone being a perfectly harmless insect, it is unable to make any resistance against the attack of three, four, or five bees; but we will suppose that a wasp, in his marauding expeditions, scenting the sweet contents of the hive, dares to encroach upon an apiarian monarchy for the

purpose of spoil, and is entrapped in his base design by the wary centinels, would he suffer himself to be repeatedly stung by them, when he could return the compliment ? and at all events, although he might be overpowered by numbers, yet he would sell his life dearly, as some of the warriors would fall by the venom of his sting; and, in this instance, the wasp would have the superiority, for he does not leave his sting after having made use of it; and no person, who is acquainted with the make of the bees' sting, but will admit that the cuticle of the wasp is of that hard nature, that the sting of the bee would most certainly remain in it, and of course the bee would die. The sting of the wasp would here have the superiority; or as it is not of that barbed nature as to prevent the insect from retracting it, the wounds made by it would occasion the death of every bee which came in contact with it. Now, we would ask the apiarians, who assert that the drone dies by the sting of the bee, whether they ever examined one of the massacred drones, and if they did, whether they ever found even a scar or a wound demonstrative of the sting of the bee ?

It is curious to observe the contradictions and inconsistencies, which often attend the observations of certain celebrated apiarians, on whose judgment many persons are disposed to rely with implicit faith, carried away by the sound of a noted name. In the case now under discussion, the Abbé della Rocca says, "In the destruction of these unfortunate insects (the drones) the bees not only make use of starvation, but they also employ their teeth and their stings; which-ever method they adopt, no injury whatever accrues to themselves; for if in stinging their victims, they left the sting in the wound, it would be found in the corpse of the drone; a part also of their entrails would be seen, and the number of those which would die, would cover the base of the hive, and prevent the ingress and egress of the bees."

We think it will be allowed that the argumentative part of this passage goes to prove, that the bee in piercing the drone with its sting does not leave it in the wound, owing to the *thinness* of the cuticle of the drone. This is very plausible, and to the unexperienced apiarian it might appear as decidedly convincing; but suppose we penetrate a little deeper into the opinion and observations of the Abbé, and we shall find that he says, "I have often seen the bees at war with the drones, and the former on being anxious to disengage themselves, found themselves *attached to the latter by their sting*, that they succeeded in retracting their sting, without dragging away their entrails, which *is a convincing proof* that the bees wound each other with the sting, without any mortal consequences."

We must however acknowledge, that it is not to us a convincing proof; for we confess that we are directly opposed to the principle, that the bees make use of their sting at all in their wars with each other, or in the expulsion of the drones. Any person may convince himself of the validity of our opinion by taking a bee from one hive, and attempt to introduce it into another, and he will immediately perceive that the bees attack the intruder, by seizing him at the root of the wings, and he will be killed in less than a minute. By a slight examination, the manner of its death will be easily ascertained.

Huber is one of the advocates for the massacre of the drones being effected by the sting of the common bee, but as is generally the case, he contradicts himself, as we shall be able to show, in the grossest manner. It is, however, rather singular that Huber himself, although we suppose neither intentionally nor knowingly, has actually described the manner in which the bees destroy the drones, nevertheless he afterwards accompanies that description with the oft repeated story of the death being occasioned by the sting. He says, in his wonderful description of the duels of the

queens, on which we shall enlarge in a future part of this work, that when nature has prompted the queens to separate, and not immediately kill each other, the stronger seizes the first opportunity of pouncing unexpectedly on her rival, and "*catches her with her teeth at the root of her wings.*" It is there that the work of death is carried on, and it scarcely takes a minute to complete the operation.

It is however very remarkable, that there is scarcely a single statement made by Huber relative to the natural history of the bee, in which he does not openly and grossly contradict himself. Thus, for instance, having in one part of his work affirmed that the bee kills his fellow, or a drone, by the infliction of its sting, we find that affirmation completely contradicted in a subsequent part of his work, page 203, where he says "*I find that the workers do not make use of their sting in the massacre of the drones, but that they make a wound with their mouth in the body of the drone, in which they emit a peculiar kind of venom, which causes the immediate death of the insect.*"

Now Huber in the above statement was literally standing on the very threshold of truth, for with the exception of the emission of the venom into the wound, he has given us an accurate description of the manner in which the death of the drone is effected. In regard to the venom, however, we have a new light thrown upon the history of the bee, for according to Huber, the bee has not only the power of ejecting its venom by the channel of its sting, but also by its mouth; from what source, however, this peculiar kind of venom which is emitted from the mouth is produced, or in what particular vesicle it is contained, or whether it be peculiar only to the working bee, as the making of the royal jelly is to the royal jelly makers, Mr. Huber is very discreetly silent. It is, however, these inconsistencies and contradictions, which would lead us to believe that Huber did not compile his work on bees from personal experience, but that

he collected into one form, the wildest theories of the foreign apiarians, and sent them into the world as the result of his own observations. This opinion, although it may appear illiberal, is in a great degree corroborated by the circumstance, that Huber, from a natural infirmity in his eyes, was wholly disabled from prosecuting his researches into the natural economy of the bee, and, consequently, that he relied solely on the skill and information of his servant François Beurnens for the veracity of those singular discoveries, which under the sanction of his name have been sent forth into the world, but which will never stand the test of a rigid and scientific examination. Now this same François Beurnens was a rude uneducated Swiss peasant, with a mind immersed in all the prejudices of his country, and who pertinaciously adhered to many of the Swiss customs in the management of bees, which have for their basis the grossest ignorance and superstition. Thus for instance, when any of the family died, in which Beurnens was the domestic, he turned all the hives in the garden topsy turvy, in which condition, they were obliged to remain until after the funeral, as it was most proper and becoming that the bees should be made to sympathize with the loss which the family had sustained, and this custom arises from a superstitious notion prevalent in Switzerland, that the bees would fret themselves to death, if an opportunity were not afforded them of witnessing the funeral of any deceased member of the family. It would however, be entering into irrelevant matter to specify any other of the superstitious customs, peculiar to the land of Huber in regard to bees, but after giving him and his assistant all the merit which is due to them for the discoveries they *did* make, it must be admitted, that in order to attach the slightest belief to some of their statements, the Genevese bees must in their nature and economy be of a different species, and subject to different laws and habits than the British bees; otherwise the experience of the

majority of the English apiarians must be wholly defective and fallacious.

Mr. Rennie is loud in his praises of the late Mr. John Hunter, relative to his knowledge of the natural economy of the bee; whereas, in the first place, there is scarcely any writer on that subject, who has fallen into greater errors in his description of the actions and habits of the bee, than Mr. Hunter; and in the second place, there is scarcely any authority which Mr. Rennie could have selected, which in many respects is more opposed to the system of Huber, than that of Hunter himself. As one proof of the inaccuracy of Mr. Hunter, we will mention his statement that the bees deposit their excrement at the bottom of a cell, and that this excrement is never cleared away by the common bees, but is allowed to accumulate, so that in time the cells become nearly full. Now the real case is, that the bees never vent any excrement in the hive at all, unless under the influence of the dysentery or any other disease, when it appears on the platform in the shape of small brownish spots of the colour of linseed, the natural colour of the fæces of the bee being of a muddy yellow. The bee, however, never vents its excrement in the cell under any circumstances whatever, but Hunter mistook the accumulation of the bee bread * for the excrement of the bee; and thus was he the instrument of promulgating an error under the sanction of his high authority, which even the veriest scholar in apiarian knowledge could have refuted.

We will now proceed to consult Mr. Hunter on the subject of the stinging of a bee, and he says, "that when they attack each other, *they seldom or never use their stings, only their pincers;* yet I once saw two bees engaged, and one stung the other in the mouth or thereabouts, *and the sting was drawn from the body to which it belonged, and the one*

* See the chapter on bee bread for a further exposition of the errors of Hunter.

that was stung ran very quickly about with it, but I could not catch the bee to observe how the sting was situated".

The same cause generally produces the same effect, and therefore it may be rationally supposed, that if the bee in the act of stinging has been ascertained in any one instance to leave its sting, it would follow as a rational deduction that the act is in perfect conformity with its nature, and that it would take place in every case it which it is called into action. Huber, however, asserts that the act of death is performed entirely by the sting, without its being drawn from the body, an assertion which has no truth for its foundation.

Dr. Howison, in the Transactions of the Caledonian Horticultural Society, says, " killing the drones by the working bees when the breeding season is at an end, is performed in a singular way, and *is done by one bee in general.* It almost uniformly fixes on the drone at the insertion of the left wing where it tears with its fangs the muscle which moves the wing, so that *when thrown from the stand of the hive it cannot rise again,* and is usually killed by the cold of the following night. No stinging or other violence is ever used, and although *the drone is four times the size of the executioner,* no attempt at retaliation is offered."

With the exception of those passages printed in italics, which are not conformable to truth or experience, Dr. Howison has in the above quotation accurately and justly described the manner in which the bee destroys the drone. Amongst the numerous authors, foreign and English, which we have perused on the natural history of the bee, we do not recollect to have met with any mention of this manner of effecting the death of the drones, but in one anonymous French author. He says, the bees either strangle the drones, or stab them with their stings ; *sometimes they content themselves with simply breaking their wings at the roots,* and then leave them to become vagabonds and vagrants on the

ground, where they soon become victims to hunger, cold, birds, and insects *."

It must, however, be admitted that it certainly does appear to the uninitiated observer, as if the bee, in the murder of the drone, was by its particular motions, actually performing the act of stinging its victim, and consequently a great allowance ought to be made for the mistake into which the majority of apiarians have fallen, especially when they have been supported in that mistake by so great an authority as Huber : we also admit that we were originally a subscriber to the opinion, that the bee did actually destroy his antagonist by the venom of his sting. Subsequent researches however, induced us to draw a different conclusion; and according to a series of experiments, instituted in the presence of Bonner and other professed apiarians, in which the results were invariably the same, we arrived at last at the positive deduction, that it is at the root of the wing that the act of death is performed †.

We will however consider the actual consequence of this

* In an old work, written by John Levett, entitled, " *The ordering of bees, or the true history of managing them,*" published in London in 1634, we find an allusion made to the killing of the drone, in the following words— " At a particular period of the year, the *big bees* are all killed off and this is done by the little or working bees, who do shoot their darts into the bodies of the big ones ; but I never did see one of these darts in the body, which makes me disposed to think, *that the tittle bees do bite the big ones to death.*"

† In the second number of the Transactions of the Western Apiarian Society, which was transmitted to us by their worthy Secretary the late Rev. I. Isaac of Moreton Hampstead, we find a communication addressed to Lord Clifford, respecting a hive belonging to Mr. J. Puddecombe of Moreton, in which that gentleman states, " I now resolved to place the drones and the queen in the hive to which she belonged. The drones were admitted, without any visible resistance ; but as soon as the queen entered, a bee brought her out again by force, and tumbled with her to the ground, and after some struggle *stung her in the corslet, and walked off dragging the queen by the sting after it.*" We have no reason to impugn the veracity of Mr. Puddecombe, but the very circumstance of the bee dragging the queen by the sting goes a great way in confirmation of our argument. It must however be observed, that Mr. Puddecombe's queen was stung in a part which is declared by Huber to be decidedly invulnerable.

instinct of the bee, supposing it to be so established, that it does in reality make use of its sting in the occasion of the massacre of the drones, the position must be granted to us, that, in strict conformity with its nature, the bee cannot withdraw its sting, and that no exception can be allowed, whether the object that is stung be a human being or one of its own species. In every case which is on record, in which the bee stings its fellow, the sting was always left in the object that is stung, for which we have quoted two authorities, Hunter and Puddecombe; now were this to be the case in the massacre of the drones, the entire depopulation of the hive would be the consequence. The bees appear to be well aware, that the drones, from their superior strength and weight, are an overmatch for them, and therefore they fall upon the expedient of reducing that strength by hunger. A single bee cannot cope with a drone, for although the former will attack it with the most determined spirit, yet from the superior strength of the drone, it will often force the bee to forego its hold by taking to its wings. The prognostic of the massacre of the drones is their exile from that part of the hive which contains the honey, and they are obliged to betake themselves to the pedestal of the hive, and in some instances the whole community are seen clustering at the entrance. Totally bereft of all power to gather its own food, the drone, expelled from the customary sources of its nourishment becomes faint and powerless, and finally falls an easy victim to the virulence and activity of the common bee, but even in this state of comparative exhaustion, it generally takes two and very often three bees to accomplish the death of a drone. Consistently therefore with that statement, if the sting were used, the death of every drone would be followed by that of two or three bees, and the total ruin of the hive be the consequence.

FIFTH CHAPTER.

ON THE PRESUMED POWER OF THE COMMON BEE TO GENERATE A QUEEN.

THE QUEEN BEE LAYS EVERY EGG IN THE HIVE—EVERY HIVE CONTAINS FOUR KINDS OF CELLS—QUESTION AS TO THE KNOWLEDGE OF THE QUEEN RESPECTING THE NATURE OF THE EGG WHICH SHE IS ABOUT TO LAY—ADMITTED BY HUBER THAT THE QUEEN LAYS THREE KINDS OF EGGS—THE COMMON BEES ENDOWED WITH THE POWER OF ALTERING THE NATURE OF THE EGG—THE QUEEN LAYS ONLY TWO KINDS OF EGGS ACCORDING TO DUNBAR—CHARACTERISTIC SHAPE OF THE DIFFERENT EGGS—POSITION OF THE EGGS IN THE OVARIUM OF THE QUEEN—THE QUEEN LAYS THE EGGS CONSECUTIVELY IN THE DRONE AND COMMON CELLS—OPINION OF REAUMUR—QUOTATION FROM DUCHET RELATIVE TO THE QUEEN LAYING HER EGGS—THE QUEEN NOT MISTAKEN IN THE NATURE OF THE EGG SHE IS ABOUT TO LAY ADMITTED BY HUBER—DIFFERENCE OF OPINION OF SCHIRACH AND HUBER—THE POWER OF THE COMMON BEE TO GENERATE A QUEEN DISPROVED BY BONNER—A QUEEN BEE CANNOT BE MADE ACCORDING TO HUBER WITHOUT ROYAL JELLY—QUEEN EGGS NOT LAID IN ROYAL CELLS—THE QUEEN CELLS MADE BY THE BEES AFTER THE ROYAL EGG IS LAID—ERRONEOUS STATEMENT OF HUBER RELATIVE TO THE CONSTRUCTION OF THE ROYAL CELLS—EXTRAORDINARY ACT OF THE BEES AS NARRATED BY HUBER—CONSTRUCTION OF A GLASS QUEEN CELL BY HUBER—THE ROYAL CELLS ACCORDING TO SCHIRACH ENJOY A HIGHER TEMPERATURE THAN THOSE OF THE COMMON BEES—PARTICULAR METHOD OF GENERATING A QUEEN ACCORDING TO SOME APIARIANS—SYSTEM OF WILDMAN—QUESTION RELATIVE TO THE CONSTRUCTION OF THE ROYAL CELLS—EXPERIMENT TO DETERMINE THE EXISTENCE OF A ROYAL CELL—THE POWER OF THE COMMON BEE TO GENERATE A QUEEN DENIED BY L'ABBÉ DELLA ROCCA—HIS SYSTEM RELATIVE TO THE FORMATION OF A QUEEN—THE CHARACTER OF THE EMBRYO ACCORDING TO DUNBAR DEPENDS UPON THE ELONGATION AND EXPANSION OF THE CELL—INVESTIGATION OF THAT THEORY—MR. DUNBAR AN ADVOCATE FOR THE ADMINISTRATION OF ROYAL JELLY—VARIETY OF OPINIONS OF DIFFERENT APIARIANS ON THAT SUBJECT—RENNIE'S SERVILE SUBMISSION TO THE AUTHORITY OF HUBER—THE CREATION OF THE JELLY MAKERS BY HUBER—CONDUCT OF MR. RENNIE EXAMINED—CANDID CONFESSION OF MR. DUNBAR—TWO SYSTEMS APPERTAINING TO THE PROPAGATION OF THE BEE—HYPOTHESIS OF MR. DUNBAR—EXAMINATION THEREOF—CONTRARIETY OF OPINION OF HUBER AND DUNBAR RELATIVE TO THE CHARACTER OF THE EGGS—DIFFERENCE OF CHARACTER ATTACHED TO THE BEES BY HUBER—THEIR RESPECTIVE KINDS OF LABOUR—MYSTERIOUS DISAPPEARANCE OF THE EGGS FROM THE CELLS—THE EGGS ACCORDING TO HUBER EATEN BY THE BEES—THE EGGS REMOVED BY THE BEES—CONFIRMED BY TWO EXPERIMENTS—THE EGGS DROPPED BY THE QUEEN LODGED BY THE BEES IN A CELL—THE SUPERFLUOUS EGGS REMOVED BY THE BEES—ATTENTION PAID BY THE BEES TO THE LARVÆ OF ANOTHER HIVE DISPROVED AS A GENERAL PRINCIPLE—ARGUMENTS OF KIRBY AND SPENCE—SINGULAR HYPOTHESIS OF KIRBY—EFFECT OF DIET ON MAN, SUPPOSED TO HAVE THE SAME ON BEES—THE NATURE OF A MAN ACCORDING TO KIRBY ALTERED BY A TIGHTER OR LOOSER DRESS, SIMILARLY CONSTITUTED WITH THE BEES—CHANGE IN THE SEXUAL CHARACTER OF THE BEE OCCASIONED BY ROYAL JELLY—KIRBY'S COMPARISON OF AN INFANT IN SWADDLING CLOTHES AND A BEE—THE CHANGE IN THE SEX OF THE BEE ACCOUNTED FOR BY KIRBY—ANALOGY BETWEEN A COW HAVING TWINS AND A BEE—CONTRADICTIONS OF KIRBY—THE ADMINISTRATION OF THE ROYAL JELLY IMPROVED UPON BY A FRENCH ANONYMOUS WRITER (Note)—KIRBY ON THE SECONDARY CHARACTER OF MAN AND WOMAN—EXAMINATION OF THE SYSTEM—FINAL REMARKS.

In the investigation of the disputed point relative to the power of the common bees to generate a queen, from any particular egg selected by them, and on which so much depends, in order to arrive at a correct knowledge of the real nature of the bee, the position must be granted to us, that the queen bee lays every egg in the hive; and the primary question then to be considered is, whether these eggs be all of one kind, or whether the egg from which a queen is to spring be of one kind, the egg from which a drone is to spring of another kind, and the egg from which a common bee of a still different one. It is a fact, well known to professed apiarians, that every hive contains four kinds of cells. First, the royal cells, in which the queens are reared; secondly, the cells in which the drones are bred; thirdly, those in which the common bees are produced; and fourthly, those which from their elongated form are appropriated solely to the reception of the honey, and in which no egg is ever laid *. On the commencement of the spring, the queen proceeds to lay her eggs, and the principal question then to be considered is, whether she is actually conscious of the kind of eggs which she is about to lay, or whether she lays them indiscriminately in the cells of the drones, and in those of the common bees, and that the eggs are afterwards by a particular process peculiar to the common bee, formed into either a queen, a drone, or a common bee. All the advocates of the Huberian system are forced to admit that the

* It is worthy of remark that the editor of the Naturalist's Library says, "that the cells in which the young bees are reared, are afterwards made the receptacles of honey." On what authority is this error promulgated? The breeding cells are never appropriated to the reception of honey, for the bee is too clean an insect to treasure up its food in a cell which has been the cradle of perhaps a dozen bees, and which consequently must be unclean. We can with certainty affirm, that we never knew any honey deposited in a breeding cell; although it must be admitted that some difficulty exists in determining the exact boundary of the breeding cells, which in a great measure depends upon the fecundity of the queen; but we deny the position of Mr. Duncan as a general principle, as being totally at variance with the internal economy of a hive.

queen does actually lay three distinct kind of eggs, but still they also aver that the common bee is endowed with the power of altering at pleasure the nature of those eggs, and it is on this point that we are decidedly at issue. Dunbar asserts that the queen lays only two kinds of eggs; but the mere scholar in apiarian science may convince himself of the falsity of that hypothesis, by comparing the eggs; which are laid in the common cells, with those which are laid in the cells of the drones. The egg of the common bee is of a cylindrical shape, more pointed at one end than the other; that of the drones is more globular, and rather larger than that of the common bee, and also more transparent; and lastly, the egg of the queen is larger than that of the drone, and when examined by a microscope, the ends of it are discovered to be flat, whilst those of the common bees are directly conical. Independently of which, on examining the ovarium of the queen, we never found that the eggs of the common bees, and of the drones alternated, or even that they were promiscuously placed; on the contrary, each kind lies in clusters; and this fact ought not to have escaped the notice of Huber. Were the eggs of the drones and the common bees to be placed alternately in the ovarium of the queen, she would have to hasten from the drone cells to those of the common bees, and *vice versa*, accordingly as she had to lay an egg from which a drone or a common bee is to spring. This, however, is at direct variance with all experience; for the queen lays the eggs consecutively in the drone and the common cells, and that fact being admitted, the deduction follows of course, that she is conscious to herself of the precise nature of the egg which she is then about to lay; for were it differently constituted, a drone egg might be laid in the cell of a common bee, and the egg of a common bee in the cell of a drone, and thus the corporeal dimensions of the respective kind of insects

would be enlarged or contracted according to the particular cell in which the egg was laid.

This opinion is, however, by no means singular, for we find it supported by the authority of the most celebrated naturalists, and, indeed, by all, who have not blindly attached themselves to the theory of Huber, and suffered themselves to be led and misled by his crude and unproven statements.

Reaumur, in the fifth volume of his History of Insects, says, page 399, "The queen bee appears to know the exact kind of bee which is to spring from the egg which she is on the point of laying, as she takes particular care not to deposit an egg in a drone cell, from which a common bee is to spring, and she never deposits an egg in one of the little common cells, from which a drone is to be produced."

Duchet says, in his *Culture des Abeilles*, page 25, in describing the nature of a queen bee, "Her chief and most important destination is to populate the hive, and to multiply the species, not only by the deposition of eggs from which queens resembling herself are to spring, but also those from which the common bees are to be produced; and incredible as it may appear, she also lays the eggs from which the drones are to emanate. This triple deposition is executed with an astonishing discernment, without committing the slightest mistake in placing an egg in any other cell than in that, which particularly belongs to the species that is to be bred in them."

Strange, however, as it may appear, Huber himself acknowledges these statements to be true, for he allows that the queen is never mistaken in the choice of the cells in which the eggs are to be deposited, "never failing," he says, "to lay those of workers in small cells, and those of drones, or males, in larger ones;" but he immediately qualifies that admission by saying, that this knowledge of the queen all

depends on the time of her impregnation; for if that circumstance has been retarded for twenty or thirty days, then the entire nature of the insect appears to be wholly reversed, or, in other words, she appears to be so stultified, that she lays her eggs in the wrong cells, the consequence of which is, that drones come out of common cells, and common bees come out of drone cells, and by way of a climax, queens come forth from common eggs, if a due proportion of royal jelly has been administered to them.

Schirach and Huber are, however, decidedly opposed to each other, in regard to the manner in which the queen is generated by the common bee, and their respective systems, as will be hereafter shown, are beset with every possible doubt and objection. Bonner, who, although a most illiterate man, was an excellent practical apiarian, was at the outset of his career one of the staunchest advocates of the system of Schirach; but the result of his own experiments by no means established the truth of it; on the contrary, the last time we visited the worthy enthusiast at Rosslyn Castle, near Edinburgh, he candidly confessed, that although he did actually succeed in *one* instance to obtain a queen, yet he was ultimately obliged to enter his protest against it as a general rule, and to deny that the common bees do actually possess the power, *per se*, of generating a queen from a plebeian egg.

It is rather singular that not one of the advocates for the alleged power of the common bee to generate a queen, will ever take upon himself to affirm that it is a fixed and invariable property of the bee, but that it is solely contingent upon a train of circumstances, which possibly may happen in an isolated case, but on the certainty of which no reliance whatever can be placed. It is also worthy of remark, that not two of the advocates of that power are of one accord in regard to the manner in which the metamorphosis of the common egg into a royal one is accomplished; in fact, the

whole of the system is entirely hypothetical, unsupported by any valid or positive proofs, and it has been received into the natural history of the bee on the mere authority of one individual, whose pretended discoveries have never been verified by actual experiment; and in the majority of cases, where those discoveries have been submitted to the test of a rigid examination, they have been found to possess no foundation whatever in truth. If we consult the compilations of Kirby, Rennie, Duncan, and Bevan, we find merely a repetition of the unverified statements of Huber, with scarcely a single fact to support them drawn from actual experience, and unaccompanied by the slightest indication of a deep and systematic research into the systems of other naturalists, who possess a greater claim to our sanction and consideration, than either Schirach, Huber, Lombard, or Feburier. If we consult the modern authors of France, we perceive a determined opposition and a dissent to the opinions of Huber, mingled with no little portion of ridicule, administered not only to the blind naturalist himself, but to all his advocates; and we are convinced that we are promoting the cause of science and of truth in seconding the foreign naturalists in their endeavours to divest the history of the bee of many of those fictions and absurdities of which Huber is the parent, and which have been so servilely adopted in this country by his numerous commentators.

Schirach, to whom we are indebted for much valuable information relative to the natural history of the bee, was a strenuous advocate for this presumed power of the common bee to generate a queen; and he says, that in order to accomplish that end, it is merely necessary that an egg, no matter of whatever kind or sex it may be, should exist in the comb, as the bees possess the astonishing power of converting it *by a process known only to themselves*, into a queen. Mr. Schirach herein however flatly contradicts himself, for he subsequently describes, or attempts to

describe the process, which consists in first enlarging the cell, and then administering a certain kind of aliment, of the nature or constitution of which he is ignorant, but which Huber afterwards discovers to be a kind of royal jelly, of the origin or constitution of which he is also ignorant. Schirach also says, that the worm of the common bee cannot be converted into a queen, unless it be three days old; Huber, on the contrary, affirms that the worm has only to be a few hours in existence to be capable of being converted into a queen. Dunbar says, a queen can be made at any time that the worm is in its larva state, and Lombard, by way of a climax, affirms, that a queen can be made even when enveloped in its cocoon. Now, without stopping here to reconcile the contradictions of these naturalists, it will be simply sufficient in the present instance to remark, that nature is here made to commit a prodigality, which is wholly inconsistent with those laws, to which she appears to be indissolubly bound. It is an inherent part of the nature of the queen bee to lay those eggs from which the future queens are to rise: but this property becomes a direct nullity, and in fact wholly superfluous, if the common bees be also invested with the power of creating to themselves a queen from any common egg that they may please to select, or even which may be selected for them, and merely by the influence of a particular kind of aliment.

There is however, one essential point, which deserves particular attention at the outset of this argument, as the validity of many of the experiments of Schirach and Huber depends upon its verification. The former naturalist very justly says, that the queen bee does not lay royal eggs in cells purposely made to receive them, but that on the deposition of the eggs, the bees construct that kind of cell around them, which is so well known by apiarians as the queen cell. This fact is perfectly agreeable to experience, for the very depth of a queen's cell precludes the possibility of a queen

depositing her egg at the bottom of it, and therefore with every new royal egg, a new cell is made. If, however, we consult Huber on this subject, we shall find him, as usual, full of contradiction and inconsistency. On the loss of a queen, he says, the bees select the common worms which are destined to be queens, and proceed immediately to construct the necessary cells, for which purpose they knock down three of the contiguous cells. When and where was this circumstance ever witnessed by Huber? We affirm that in the construction of a royal cell, not a single common cell is ever destroyed. The queen bee knows well the particular egg which she is about to lay, and she almost invariably deposits the royal eggs on the edge of the comb, and the bees construct the circular royal cell around them. In the supposed case of the bees converting a common worm into a queen, they are made to sacrifice three cells, but then, where and how are these cells situated? The common bee is bred in a horizontal position, the queen in a vertical one, therefore the actual inclination of the comb must be changed, in order to allow of the bees constructing a cell in that position in which the queen is always bred. The actions of the bees, however, during this creation of a queen, are according to the description of Mr. Huber of a truly wonderful nature, for on the completion of the royal cell, we are informed that a bee kept its head more or less constantly inserted in it, and that after an appointed time, he was released by another, who also put his head into the cell, and there remained until released by another, and so on, until the purposes of this most extraordinary act were accomplished, but what those purposes were, Mr. Huber professes his ignorance. Finding however, that the opacity of the queen's cell as constructed by the bees, was a great obstacle to the prosecution of his researches, Mr. Huber constructed a queen's cell of glass, in order that by its transparency, he might be able to ascertain the whole of the proceedings within; now

glass, in regard to heat, was perhaps the very worst substance which Mr. Huber could have selected, for warmth is actually indispensable to the growth of the worm through every stage of its metamorphosis. He however proceeds to state that he placed a worm that was to be a queen in the glass cell, and it was fastened in the hive, in order that the royal nymph might enjoy the degree of heat necessary for its growth and expansion. It however belonged to Mr. Huber to inform us in what manner the worm thus artificially deposited in a cold solid substance could possibly enjoy that degree of heat, which was fully necessary for its development, independently of many other circumstances, which verge strongly upon the impossible. Schirach affirms that the royal cells enjoy a higher temperature than those of the common bees. Dissenting however wholly from the truth of that statement, as a circumstance wholly impossible, it must be admitted on all sides, that neither that higher temperature, nor even an equal degree of temperature, can be either obtained or maintained in a glass cell, in which no queen bee was ever yet, nor ever will be bred, except in the fancy of the Huberians. In fact, the whole experiment is a tissue of impossibility and fiction.

We invite all the adherents of Huber to a repetition of the experiment, as described by that naturalist—let them place a royal egg in a glass cell, and the result will be that it will remain as a royal egg, without the slightest change, for the only notice which the bees will take of it, would perhaps be to tear it from the cell: it would be truly an apiarian miracle, were a queen to be reared in it, and even were Mr. Nutt to be called in as a professional adviser to elevate the temperature in and about the glass cell, to that degree in which queen bees are generally bred.

The method of generating a queen as approved of by some apiarians, consisted of extracting from a prolific hive a certain portion of comb, filled with eggs and larvæ; and

having fastened it into another hive, then to introduce a number of common bees, who are to proceed in the regular manner to nourish the brood and create for themselves a queen. Wildman very justly says *, that the combs so introduced into the hive must contain a royal cell, in order to secure the birth of the new monarch, and this celebrated apiarian was here actually standing on the very threshold of truth; for it is a fact, not to be disputed, although it strongly militates against the system of Huber, Dunbar, and the other advocates for the generating power of the common bee, that the existence of a royal egg in a cell is a positive *sine qua non* in the generation of a queen, and we believe that no one, with the exception of Huber, will be hardy enough to assert that a queen bee was ever bred in the cell of a common bee. But in this instance, the main question to be decided is, whether the formation of a royal cell precedes the laying of the royal egg, or whether the royal egg having been deposited in any particular cell, and being recognised as such by the working bees, they immediately proceed to enclose it in that particular form of cell, by which a royal one is distinguished. According to the affirmations of Huber, either case is feasible; but according to every experiment, which we have tried and supported by the experiments of others, we may venture to declare the latter to be the real course that is pursued, for with the view of ascertaining the

* Without attempting to depreciate the character of Wildman as an apiarian, it may nevertheless be worthy of remark, that in the compilation of his work on bees, he can lay a very slight claim to originality, the greater portion of it being an abridgment of the systems of Maraldi and Reaumur, as inserted in the Mémoires de l'Académie des Sciences de Paris. His apparently unlimited control over the bees procured for him the character of a conjurer, but the influence of fear and a correct knowledge of the natural habit of the queen bee, were the only witchcraft which he used. He might have astonished George the Third of England, which, by the by, was no very difficult matter, by showing him a cluster of bees hanging from his arm; but after all, it was nothing but a species of quackery, for let any one place a queen bee upon his arm and the bees will immediately cluster upon it. It was however on this kind of *Charlatanerie* that the fame of Wildman was founded.

accuracy of Huber's experiments, we selected one of our most populous hives, and at the beginning of the season we took out all the combs, (the bees being in one of the hives of our own invention) and after the most minute inspection, we satisfied ourselves, that not a single royal cell was then in the hive. It must be here distinctly understood that we do not mean to say, that there were no *old* royal cells, as five were distinctly visible; but we mean to affirm that not one was in existence, from which the queens of the approaching swarm were to originate. Having convinced ourselves of that fact, we examined the hive every day, and a fortnight had scarcely elapsed, before we obtained the object of our researches. We perceived what may be termed the foundation of a royal cell, and on looking into it, the egg was distinctly visible at the bottom of it. At the expiration of the usual period, the cell was completed and closed up, and the observations, which we then made, as will be seen in the sequel opened to us a new field for the prosecution of our researches into the validity of the system as promulgated by Huber, and supposed to be confirmed by Mr. Dunbar.

The Abbé della Rocca, who is no mean authority on all points relative to the natural history of the bee, is decidedly opposed to the hypothesis of the common bees having the power of generating a queen from a common egg; and he so far dissents from the generally received opinion, that the queen is never mistaken in the kind of egg that she is about to lay, or that she ever lays an egg in a cell which is not appropriate to the particular species that is to emerge from it; that a strong persuasion rested on his mind, that the queen, independently of the common eggs which she lays during the season, deposits royal eggs even in the cells of the common bees, and that whenever the hive is in want of a queen, the bees construct a royal cell and convey the royal egg to it, in order to rear for themselves a queen. But on

the other hand, should the hive not be in want of a queen, they then destroy all the royal eggs.

There is something extremely plausible and probable in this hypothesis, for it not unfrequently happens that the queen, from the extreme rapidity of her ovipositing, lays two and even three eggs in the same cell, and that the bees then remove the superfluous eggs, and deposit them in the first cell that they find vacant; it may, therefore, be analogically presumed, that if the queen laid a royal egg in a common cell, and the bees were conscious of the existence of such an egg, they would not on the loss of their queen delay for a moment to remove the royal egg, and place it in such a position, that a proper cell might be constructed for the due expansion of the queen's body. This hypothesis is by far more rational than that of generating a queen from a common egg, the sexual character of which is wholly different from that which is to be produced.

We will, however, examine in what manner the advocates for this alleged power of the common bee to generate a queen, attempt to emancipate themselves from the difficulty into which their exuberant fancy has led them. We have already taken notice of the notable discovery of Huber, that the common egg cannot be metamorphosed into a royal one, without a seasonable and abundant supply of royal jelly; and Mr. Dunbar is so fortunate as to have made another discovery, which, in point of truth and merit, deserves the same consideration as the royal jelly. The worthy minister saw himself completely bewildered in his attempt to invest the common bee with any procreating power in regard to the metamorphosis of a common egg into a royal one, and therefore he hit upon the expedient that the simple elongation and expansion of the common cell from the hexagonal shape to the cylindrical one in which the queens are always bred, may very possibly possess the property of imparting a different character to the embryo, than if it had remained

cooped up in the common hexagonal cell. We must confess, however, that it is far beyond our power of discernment to discover what possible influence the mere change in the formation of a cell can possess on the sexual character of the insect. The only effect that we can conceive would exhibit itself, would be the production of a common bee of rather larger dimensions than its fellows, but resembling them in every other respect, and particularly in their neuter gender. If a queen were to lay an egg from which a common bee is to spring in one of the drone cells, or a drone egg were laid in one of the common cells, we can easily suppose that the surprise of Mr. Dunbar would be great, were he to see a drone emerge from the former, or a common bee from the latter; and yet that event would not be more marvellous, than if a queen were to burst forth from a common cell which has been elongated by the common bee, and this most extraordinary metamorphosis were to originate from the mere change in the construction of the cell. An effect has always some proximate or remote affinity to the nature and constitution of the cause; but in the case now under consideration, it is impossible to trace the slightest affinity between a direct and positive change in the nature, gender, and properties of an embryo insect, and the greater or less construction of the cell in which it is bred. In this presumed elongation or expansion of the cell, Mr. Dunbar has, however, a difficulty to surmount to which we have already previously alluded, but which in a certain degree appears to have escaped his notice. It is very possible, that if the egg from which the queen is to spring were laid on the edge of the comb, to give to the cell that expansion which might be necessary for the full perfection of her form; but how is this to be effected, if the egg selected by the bees be laid in the middle of the comb, so as to extend the make of the cell horizontally; and again, how can the cell be enlarged *internally*, so as to admit the full growth of the queen? Under

such circumstances, she must emerge from her cell a kind of cripple, completely contracted in her posterior parts, and fully grown in her anterior, nor is it the least curious part of the system promulgated by Huber and Dunbar, that they have in no one instance mentioned the exact position of the egg which the bees selected for the purpose of metamorphosing it into a queen. We therefore consider ourselves at liberty to take that position most favourable to the support of our own system, and we will fix upon the egg to be metamorphosed into a royal one, as being deposited in the middle of the comb, being conscious to ourselves that we thereby expose our opponents to the solution of the chief difficulties of the question.

Mr. Dunbar, however, does not rely solely upon the expansion and elongation of the cell for the procreation of a queen, but he also coincides with Huber in the administration of the royal jelly, for he says, "that the bees supply the larvæ of the intended queens with food of a different and superior quality to that with which the common bees are fed while in the brood state." But were even this point conceded to Mr. Dunbar, it does not thence follow that this simple supply of a different kind of food can in any degree alter the sexual character of the egg. There must have existed previously a supervening power, which altered the original character of the egg; and as far as the analogies of nature can be traced, such an alteration could only be effected by a fecundating power or principle which is wholly foreign to the common bee, it being entirely destitute of any organ of generation, and in which no seminal fluid has ever been discovered.

> "Illum adeo placuisse apibus mirabere morem,
> Quod nec *concubitu indulgent*, nec *corpora segnes*,
> In *venerem solvent*, aut *fetus nexibus edunt*."

In the metamorphosis of the common egg, the destruction of one vital principle must be effected before another of a

different kind can be created, and neither Huber nor Dunbar ventures to face this difficulty; on the contrary, the former places his whole reliance upon the royal jelly, which must be destructive and creative at the same time, and the latter has recourse to the simple elongation and expansion of the cell, as if by such an act, the slightest effect could be produced in the alteration of the sexual character of the egg.

Had the advocates for the alleged power of the common bee to generate a queen been uniform in their principles, or been of one accord in regard to the manner in which it is accomplished, a greater degree of validity might have been attached to their hypothesis; but it is not a little singular, that, although all of them agree that the metamorphosis can in reality be effected, yet all of them differ as to the means employed for its accomplishment, whilst at the same time, each of them pretends that his peculiar system is the successful result of positive and repeated experiments. This is in itself alone sufficient to throw the highest degree of discredit on the very existence of such a power; for if Huber informs us that the metamorphosis can be effected by the simple administration of some royal jelly, and another theorist informs that it can be effected by the expansion of the cell, and a third steps in with the information that it can be effected by some unknown prolific effluvium emanating from the common bee, to which of these systems are we called upon to attach our belief? Mr. Rennie, although he publicly declares *that he does not easily bend to authority, however high,* has so far contradicted himself by bending most servilely to the authority of Huber as an infallible experimentalist, and he has bruited his discoveries to the world as decisive of many of the contested points in the natural history of the bee, and not only of the bee itself, but also of its productions, as will be seen, when we come to treat of the origin of wax as laid down by Huber, and attempted to be confirmed by the acquiescence of Mr.

Rennie. Can it be credited that a professor of natural history in the King's College of London, could have allowed himself to be so led and misled by the authority of one individual, as to support and disseminate the unnatural and irrational doctrine of an insect, in itself possessing no procreating nor creating power, being enabled by the administration of some undefined and inexplicable liquid, designated as royal jelly, to change the sexual character of an egg, and to endow it with properties, faculties, and virtues, which were not bestowed upon it by the parent? Huber, however, is by no means scrupulous in drawing very largely on the credulity of those, who have been blindly led to espouse his system under the influence of its extreme novelty and originality. He appeared in the community of apiarians as the very Mungo Park of them, and his astonished partizans triumphantly declared that he had penetrated deeper into the hitherto partially explored subjects of his research than any of his predecessors. The names of Reaumur, Swammerdam, and Schirach were considered as no longer worthy of being quoted on the subject of the natural history of the bee, and Huber uprose as the sovereign authority, from which to dissent was construed into an act of heresy.

It is a fanciful conceit of certain apiarians with Huber at their head, that the queen bee obtains her particular character, so wholly different from the common bee, not from any distinct virtue inherent in the egg, but from the peculiar make and construction of her cell, by which her ovarium becomes elongated and expanded, and she comes forth a different insect than by her nature was originally intended. By the latter expression we are led to understand that the egg from which the queen originated, was at its deposition in the cell the egg of the common bee, and that it has been changed into that of the queen by the particular make of the cell in which it is laid. Now, it will not surely be contended that the simple elongation or expansion of the

cell can by some miraculous power bestow an ovarium upon an insect which is not inherent in its nature? and therefore, in the elucidation of this mystery, we see ourselves naturally obliged to have recourse to another hypothesis, which is, that the whole nature of the egg was changed by the common bees, according to some process known only to themselves, which process imparted an organ, namely, an ovarium, of which they, the creating bees, are themselves destitute. This is, however, investing the common bee with an almost supernatural power, and implies the existence of a generating principle in an animal in itself a confirmed neuter, which is not only an insoluble paradox, but it also pre-supposes a concert of action in a very numerous population, which comes equal in effect to any act resulting from the operation of human reason. Huber was well aware of the dilemma into which he had plunged himself by the promulgation of so extraordinary a theory; he saw that he had advanced beyond the limits of analogy or probability, and he found himself at length necessitated to admit that the common egg cannot be transformed into a royal one without the aid of some extraordinary power; but then the momentous question arose, where was he to look for that power? He dare not invest the bee with any generating faculty, although he had bestowed upon it an ovarium, or, more correctly speaking, the germ of an ovarium; and therefore, rather than retrace his steps and acknowledge the error into which he had fallen, he dashes forward like a man in despair, into the very first path which appeared to promise him an outlet, and putting his fancy to the utmost stretch, he invents a particular species of bees to whom nature has given the peculiar power of concocting a species of jelly, and this invention, boldly and unblushingly promulgated by Huber, is echoed by Kirby and Rennie, and a host of prejudiced adherents, as proper to be received into the natural history of the bee. Mr. Rennie should have paused, and paused

long, before he degraded himself by being the instrument of disseminating so gross and incoherent a fallacy. He should have called to his aid the experience of others, as deeply and deeper versed in the natural history of the bee, than Huber himself; he should have consulted the common analogies of nature; and, as his support, he should have sought for a single precedent in which the organic or sexual character of the egg can be changed after its deposition by any accidental principle, exteriorly administered. Huber positively asserts that this royal jelly does actually possess the specific virtue of imparting to a common egg all the powers and properties of a royal one, at the same time that we are left wholly in the dark in regard to the source whence this royal jelly emanates; whether it be a compound of certain unknown ingredients, or whether it be a natural substance, which the bees find ready prepared for them by some kind and charitable flower, whenever the demise of royalty in the hive renders its application necessary. Nevertheless, Huber has determined that these royal jelly-makers do exist in the hive; that they are in some respects the *élite* of the community; and that by virtue of their extraordinary compound, they possess the power of metamorphosing a common egg into a royal one; and for this most astounding discovery, he is lauded as the chief, "the prince of apiarians."

On the other hand, Mr. Dunbar, who distinctly perceived the difficulty with which the subject is surrounded, and not being inclined to be servilely led by Huber, nor to attach any belief to his creation of the jelly-makers, candidly and ingenuously confesses that it is a difficulty which he cannot overcome; but still he admits the fact of such a power being invested in the common bee of generating a queen, but by what means it is accomplished, he will not venture to go further than mere conjecture.

There are five systems appertaining to the propagation of the bee, each of which has it most zealous adherents, and

the main purport of which is to establish and confirm the long-contested point of the fructification of the queen bee. The first of these systems is, that the egg is fructified in the cell by the drone after its deposition by the queen. The second is, that the egg is fructified by the drone in the ovarium of the queen, previously to its deposition. The third is, that it is not necessary for every egg to be individually fructified by the drone. The fourth is, and which may be considered as the system of Huber, that it is merely requisite for the ovarium of the queen to be fructified by one single act of coition with the drone to endow it with fertility during the remainder of her life. The fifth is, that the queen is male and female, mother and virgin at the same time, or in other words, that she is self-fecundated; and this truly erroneous system gave rise to the ruinous practice of killing the drones immediately on their appearance, considering them as a kind of abortion in the hive, and divested of all positive utility.

In all these systems it is acknowledged that the queen lays three kinds of eggs; but the system of Mr. Dunbar differs from them, inasmuch as he protests that the queen lays only two kinds of eggs; and considering the experience which the worthy minister must have had in the management and internal economy of a hive, our surprise must be naturally great to find him promulgating a doctrine which is decidedly at variance with the most indisputable authorities. Mr. Dunbar, however, evidently perceived that if he permitted the queen bee to lay three kinds of eggs, his whole system would not have one single *point d'appui;* and, consequently, he rather inverts the order of nature, and bewilders himself in the mazes of doubt and contradiction, than, by rigidly persevering on the road of experience, arrive at last at the goal of truth.

Consistently with the hypothesis of Mr. Dunbar, the creation of a queen depends entirely on the will and conceit

of the common bees; and further, that the germ of royalty is never existing in any particular egg, but, on the contrary, that the metamorphosis from the plebeian egg to the royal one is occasioned by the spontaneous co-operation of the community at large. The arguments of Huber go to prove the same thing, although he so far admits in opposition to Mr. Dunbar, that the queen does actually lay a royal egg, but that it is in default of a royal egg being in the cells, that the bees possess the power of transforming a common egg into a royal one. The queens of Mr. Dunbar are, however, made without the super-addition of any royal jelly; but how or by what other nostrum they are made, he is at a loss to decide, although he tacitly admits that some food of an extraordinary efficacy, and of almost miraculous power, is administered to the embryo queen. Considering, however, the advantages which the use of the mirror hive imparted to Mr. Dunbar, whereby the internal economy of the bee can be investigated and ascertained, as far as the bees will allow of such examination being accomplished, which is very limited indeed, it is surprising that he never took the trouble to examine the difference in the shape of the eggs which the queen lays in the common cells, in the drone cells, and in the cell in which a queen is to be generated. Had he imposed upon himself this task, he would not have committed himself so egregiously as to disseminate an error, which would scarcely have been tolerated in the dark ages of Varro and Columella. The egg of the common bee and of the queen is as distinct in its form and general appearance as the egg of a turkey and a bantam; but here Mr. Dunbar may step in and say, that such difference is actually effected by the common bee, and that all the distinctive properties of the royal egg are imparted to it subsequently to its emission from the ovarium of the queen. This is, indeed, the only outlet through which the worthy minister can escape; but we rather suspect it will be found, that having put forth all

his talent and ability, he will not be able to extricate himself from the dilemma in which he will find himself involved : for surely he will not be so bold as to assert that the difference in the make of the egg is produced by the mere power and co-operation of the common bees, and that no distinct form nor property was imparted to it, whilst in the ovarium of the queen? The solution of this question is of considerable importance in the prosecution and adjustment of the present inquiry ; for on its confirmation or refutation must depend a great portion of the validity of the long-disputed theory of the common bees being able to generate a queen from any particular egg selected by them for that purpose. Mr. Dunbar himself admits that the queen lays two kinds of eggs; and on taking into consideration the general principles of his theory, it is a very bold admission: for are we thence to infer, that, let the egg which the queen may have just laid be of whatever kind it may, the common bees are invested with the power of altering at their pleasure its distinctive character, and by some secret and inexplicable process imparting to the embryo a different nature than that which actually existed in it at the moment of its emission from the ovarium of the queen? If we in this respect confront the two systems of Dunbar and Huber, into what a labyrinth of perplexity and contradiction do we find ourselves entangled. Mr. Dunbar is satisfied with the existence of one kind of common bee in the hive ; not so, however, was Huber, for as we have already observed, according to his creative fancy, we have five kinds of common bees,—viz. nurse-bees, wax-makers, wax-workers, royal jelly-makers, and lastly, the unfortunate black bees. How, then, will Mr. Dunbar account for the generation of these five kinds of common bees? Huber, the inventor of the system, cannot assist him out of the difficulty, for, according to his observation, the queen lays only three kinds of eggs, from one of which originate the common bees; but, nevertheless, these common bees have five dis-

tinct and separate characters attached to them, although they have all sprung from the same kind of egg. If this distinction of character had been confined to the peculiar kind of labour performed by each kind of bee, we would have attempted to assist Huber out of his dilemma, by supposing that the bee at its birth takes upon itself that peculiar kind of labour to which it feels a natural inclination, on the same principle that a human being is led by his own fancy to become a tailor or a bricklayer. When, however, we are informed that these different kinds of bees are distinct in their make and colour; that one kind has an ovarium, and another has not; that the bladder of one kind will be distended if filled with honey, but that, let another gorge itself to satiety, no such distension whatever takes place; that one bee can concoct the royal jelly, whilst another is ignorant of the art; that one bee can make a cell, and another cannot; we are then entitled to draw the inference, that if there be five distinct kinds of bees, there must be five distinct kinds of eggs. The fact being admitted, that the queen lays three kinds of eggs, the metamorphosis or alteration of the innate principle or germ of these eggs becomes the great difficulty which Huber and Dunbar have to surmount. It is, however, not a little singular, that those two naturalists, in their attempts to account for the generation of the common bee, have in reality touched at the two opposite extremes to which it was possible for their fancy to lead them.

We will, in the first place, examine the statement of Mr. Dunbar, and on his admission that the queen lays only two kinds of eggs, he has wholly remembered to forget to inform us of the precise nature and character of those two kinds of eggs; and thus, with the knowledge that there are three separate and distinct species of insects in the hive, we are left wholly in the dark how to account for the manner in which that particular kind of bee is generated, of which the egg is wanting. Three kinds of eggs will naturally produce

three kinds of insects; but in what manner two kinds of eggs can produce three different kinds of insects, is a problem not easy of solution. In further illustration of this knotty point, let us suppose that the queen lays only royal and common eggs—from what eggs then are the drones produced? If we revert the position, and suppose that only drone eggs and common eggs be laid, how then are we to account for the generation of the queens? It is in the latter case that Mr. Dunbar will interfere, and say there is not any occasion for a royal egg, as the common bees select an egg of their own species, and convert it into a royal one. This is, indeed, not saying much more than Huber said before him, with this difference only, that Mr. Dunbar makes the creation of the queen a fixed and universal habit of the bee, whereas Huber allows of it only on the demise of a queen, and no royal egg existing in the hive. The power of the metamorphosis is thus admitted by both; but in this particular, Huber and Dunbar have far outstripped both their predecessors and their contemporaries: for Schirach, Bonner, Ducouedic, and other advocates for the alleged power of the common bee to generate a queen, all admit that the queen bee does actually lay three kinds of eggs; but that it is only in default of a royal egg existing in the hive, that the common bees take upon themselves to exercise their miraculous power of altering the nature of a common egg into that of a queen. Mr. Dunbar, however, asserts it to be a positive feature of their natural economy; and in support of his theory, he says, that the egg which the queen bee lays in a royal cell, would, if deposited in a common cell, produce a working bee. This is, however, at variance with all experience: for Mr. Dunbar must be aware, that the construction of the royal cell does not precede the laying of the royal egg, and that the bees do not indiscriminately choose any particular egg, which at their pleasure they convert into a royal one.

It is a circumstance verified by almost all apiarians, that

the eggs disappear sometimes from the cells in rather an extraordinary manner; but we have generally found that those eggs are abortive ones, which the bees, on finding them to be useless, proceed to remove immediately from the cell, in order to make room for others, which the queen may have to lay. Huber, however, totally denies the removal of the egg from cell to cell, and he accounts for their disappearance in a manner truly Huberian and original; for he affirms that, with the true spirit of the gourmand, they proceed to eat them!! in which act, however, he confesses that he never entrapped them; but not knowing exactly how to account for the disappearance of the eggs, and scorning to be guided or to profit by the experience of others, he conjectured that he could not hit upon a more expeditious or a more easy method of accounting for it, than to make the bees eat them. Now, without entering into any discussion of the unnatural and improbable hypothesis of the bees eating the eggs, we are able to affirm that the bees do actually remove the eggs; and this was confirmed by two experiments, in the first of which we discovered that the queen, contrary to her usual habit, had deposited more than one egg in a cell; and this is by no means a case of uncommon occurrence in the vigour of the breeding season, when the queen, from the extreme rapidity with which the eggs emerge from her ovarium, is scarcely able to pass from cell to cell without dropping one of her eggs, and in some cases, the eggs will be actually found upon the platform of the hive, when the bees will proceed immediately to lodge them in a vacant cell. It is well known that the bees will drag out an abortive nymph from the cell, and carry it out of the hive; but the mere disappearance of this nymph would not entitle any one to draw the conclusion that the bees had made a meal of it. It, however, frequently happens, that there is not a vacant cell in which the queen can deposit her eggs; and in that case, she will lay sometimes two and sometimes three

in the same cell, but the bees will always remove or destroy the superfluous ones, leaving only one in the cell. Huber affirms, that, in general, the bees pay great respect to the eggs of the queen, in whatever situation they may be found; it is, however, no great proof of such profound respect, if they fall to and devour them. Further, he asserts, that if a comb filled with brood from any other hive be placed in another, the bees in that hive will adopt the brood as their own, and pay the requisite attention to the future nourishment of it. We do not deny that this may take place in an individual case; but as a general principle of action, it has not the slightest foundation in truth. We have frequently placed in a hive a piece of comb filled with larvæ, for the purpose of strengthening a weak hive; but so far from the bees taking the proper care of it, they have treated it with the most marked hostility, tearing the larvæ from the cells, and then destroying the combs altogether.

In regard to the ovipositing of the queen, it is rather singular that few naturalists are of one accord as to the exact period when she lays the different kinds of eggs, from which are to spring the various species which form the community of the hive. It is, however, but rational to suppose, that it is to the later writers on the natural history of the bee, that we are justified in looking for the fullest and most correct information on that interesting part of its physiology. If, however, we consult the editor of the "Naturalist's Library," in what a tissue of error do we find ourselves involved, in regard to the laying of the eggs by the queen. Mr. Duncan says, "*that about the beginning or end of May*, the bees, as if aware of the necessity, begin to form large cells, in which the queen immediately deposits the eggs of males, and *continues to do so for thirty days;* at the same time, *some royal cells are formed;* for there appears to be a secret relation between the production of the eggs of males and the construction of royal cells." Now, in the foregoing

paragraph, there is scarcely a single sentence, that is not surcharged with error: for does Mr. Duncan mean to affirm, that the queen does not lay any drone eggs until the beginning or end of May ?—if so, he asserts what is directly at variance with all experience ; for, according to that principle, the drones would not make their appearance until the beginning or end of June, whereas we generally look for them about the close of April *. As to the limitation of the laying of drone eggs by the queen to thirty days, it is decidedly erroneous; for the queen commences to lay drone eggs at the close of January, or the beginning of February, and ceases about June or July. But how does this statement of Mr. Duncan agree with that of his great authority, Huber, who says that the queen will lay male eggs for eleven consecutive months ?—either Mr. Duncan or Mr. Huber must be in the wrong; but we will settle that question at once, by declaring that both of them are in the wrong: the queen has not any eggs in her ovarium from August or September to January; and we will venture to affirm, in despite of the authority of Huber, that no apiarian ever knew the queen bee to lay an egg in the month of November. There is another circumstance in which we cannot coincide with Mr. Duncan, wherein he says the bees begin to form large cells, that is, drone cells, the beginning or middle of May. Now did Mr. Duncan ever examine the interior of a hive, and in that examination, did he not discover drone cells in the middle of the combs, and which were constructed when the combs were originally made ? According, however, to Mr. Duncan's showing, the drone cells are not made until the queen be prepared to deposit her eggs in them ; the direct contrary

* In corroboration of this statement, it may be stated, that a hive belonging to Mr. Jameson of Hackney swarmed this year 1841, at the end of April; consequently, as there never yet was a swarm without drones, the eggs from which originated the drones belonging to Mr. Jameson's hive, must have been laid in the month of March. A hive that has not any drones in it in the month of May, is not worth preserving, nor will it survive the winter.

is, however, the fact; for the formation of the drone cells is a necessary and indispensable condition of a hive, and we never saw a hive without one, except a poor second or third swarm, in which the breeding of the queen appears to be altogether suspended.

We will now briefly allude to the arguments adduced by Kirby and Spence to account for the difference which is created in the common egg by the administration of a certain modicum of royal jelly; for they also avow themselves to be believers in the potency of that most extraordinary aliment. We doubt not that the following most delectable specimen of analogical reasoning by Kirby, in order to account for what has hitherto been deemed unaccountable, will meet with all the respect which it deserves. The difference in man, says Mr. Kirby, may be caused by a particular diet in childhood; and this we know to have been also the opinion of the late Sir Samuel Romilly, who, when he placed his children at a seminary at Chelsea, issued his most positive injunction that they should not be allowed to eat pudding, particularly if made with suet, as it had a direct tendency to make all those who partook of it, the most finished blockheads. Thus it may be argued, that if diet possesses such a positively injurious effect upon the intellectual faculties of man, Huber and Kirby are certainly warranted by analogy in supposing that royal jelly may have a wonderful effect upon the faculties of the worm of a bee. A difference in man, says Mr. Kirby, is also occasioned by a warmer or a colder, a looser or a tighter dress; therefore he considers himself warranted in asserting, that a similar effect may be produced by giving to the nymph of the bee a warmer or a colder, a tighter or a looser dress; and by way of satisfactorily elucidating this principle, Kirby informs us, that the Egyptians, who went bare-headed, had their skulls remarkably thick, while the Persians who covered their head

with a turban or a mitre, were distinguished by the thinness of it.

Now we are fully disposed to award to Mr. Kirby all the merit which his reasoning deserves; nor will we here stop to inquire, whether, when he compiled the article on the bee, in the second volume of his "Introduction to Entomology," he had been accustomed for some time previously to go bare-headed like the Egyptians, by which an extraordinary thickness in his skull had been produced; but we shall here simply confine ourselves to the question, that although the local circumstances mentioned by Kirby may have had a decided influence on the physical constitution of man in Persia and Egypt, still there is no proof existing that a particular diet will alter the sexual character of the individual, or that the masculine gender of an Egyptian or a Persian was ever metamorphosed into the feminine, accordingly as he might be fed on dates, rats, or royal jelly. The egg from which the larva emanates, that is selected by the jelly-makers to become a queen, was at the moment of its deposition that of a common sterile worker, and would, at the period of its full development, have produced, according to Huber and Kirby, a female bee, decidedly sterile. On the bees, however, forming a resolution to convert the sterile female into one of the most surprising fecundity, and thereby changing in the most direct manner its original nature, it is merely necessary to supply the larva with an extraordinary dose of jelly, by which simple act, the odium of sterility is removed, and the blessing of fertility imparted. The entire innate organic structure of the insect undergoes a decided metamorphosis; and this creative power is given to a few individuals in the hive, by virtue of a certain aliment, to alter and convert the original disposition of the egg, and transform it into an insect of a wholly different character, faculties, and properties, than it would have been, if such aliment had not been

administered. "An infant," says Mr. Kirby, "tightly swathed in swaddling-clothes, and fed with an unwholesome food, or uncherished by genial heat, may become sterile." This may or may not be true, nor will we stop to discuss so knotty a point; but the question which we have to consider is, whether the sex of the infant be changed by the erroneous treatment?—the development of its organic structure may be cramped and deformed; its functions may be impeded or diminished in power, but its sex remains without the slightest alteration or difference. It must, however, be borne in mind, that we consider the common bee to be a decided neuter; and, consequently, the effect of the royal jelly must be to us still more wonderful, than merely possessing the power of changing a sterile nature into a fertile one: for according to Kirby and Huber, an actual change in the sexual character is effected.

Mr. Kirby, however, enters further into the field of analogy, in order to account for this change in the sex of the bee; but we confess that we are so grossly stupid as not to be able to trace the slightest analogy in any of the cases. "If a cow," says Mr. Kirby, and he quotes John Hunter as his authority, "brings forth two calves, and one of them is a female, it is barren; and this is owing to there being two in one dwelling, where there should have been only one, and consequently receiving a smaller share of nutriment, which has an effect upon the ovaries *."

* The twins of a cow were formerly called *John Martins*, an etymology, which would have puzzled Johnson more than the obnoxious word, mahogany. John Hunter, however, is rather an unfortunate authority to depend upon in all matters relative to the bee; and Kirby, before he quoted Hunter on the barrenness of the twins of a cow, and thence inferring the sterility of the bee, should have ascertained whether Hunter was correct in his allegation relative to the barrenness of the twins, arising simply from the contracted space in which they are bred. We admit that the barrenness of the cow's twins was formerly currently acquiesced in, but subsequent researches have entirely exploded that opinion, and the fertility of the female twin is now indisputably confirmed.

It is left to the ingenuity of Mr. Kirby to discover the analogy existing between a cow bearing twins and the transformation of a sterile bee into a fertile one, by means of the administration of the royal jelly. The two cases are in some respects directly in the opposite extreme. The sterility of one of the calves is occasioned by the contraction of the space in which it has to move; whereas the sterile bee is converted into a fertile one by the enlargement of the space in which it is bred. The ovary of the calf is effected also by the contraction of the space, and the smaller share of nutriment which it receives; on the other hand, the ovary of the bee is effected by the enlargement of the space, and its fertility is occasioned not by any lack of nutriment, but by the administration of some prolific fluid imparted to it by some barren fellows of its own species *. According, however, to the analogical reasoning of Mr. Kirby, we are led to understand, that if the eggs of a bee be bred in a confined space, and the prolific jelly be administered to it in a small proportion, its ovary cannot be developed, and it becomes sterile. This hypothesis, however, is in direct opposition to that of Huber, who says, that if the jelly be administered in a small proportion, the ovary becomes expanded; but if administered in profusion, then an actual metamorphosis takes place, and the larva of the common bee becomes a royal one. Kirby

* A French anonymous writer has improved upon the system of Huber in regard to the administration of the royal jelly, and he says, "the quantity of the nutriment is proportioned to the age of the worm. When it is young, the jelly is whitish, and as insipid as paste; at a more advanced age, the jelly is either yellowish or greenish, having the taste of sugar and honey; the worm having finally attained its full growth, the jelly has the taste of sugar mixed with acid. It is supposed *that this jelly is composed of honey and wax*, which have undergone a greater or less degree of digestion in the stomach of the bees." A supposition which, on account of its gross deviation from truth, ought to be inserted in the next edition of the "Insect Architecture," published under the auspices of the Society for the Diffusion of USEFUL KNOWLEDGE. In order to invalidate the above statement, it will be merely necessary to observe, that wax never undergoes digestion in the stomach of the bee, nor does it form any part of its nutriment.

must therefore have either misunderstood the theory of Huber, or he must have misunderstood himself; at all events, he has advanced a new doctrine, pretended to be founded on his own experience, which we suspect to be very limited indeed, or he would not have disfigured his work by the insertion of so many of the absurdities of the Genevese apiarian.

Let us, however, proceed in our analogies; and we adduce the following as a most talented specimen of logical reasoning on the part of Mr. Kirby. It is admitted on all sides that nature does at times commit some most extraordinary freaks, as if she were determined to caricature her own works, and send forth into the world some oddities, which cannot be classed under any of the known genera of animated beings. The chief primary character of all animals is the propagation of their own species; but there are secondary distinctive characters, which are generally the effect of old age, and which Mr. Kirby here calls in to assist him in his illustration of the theories of Huber. Thus, says Mr. Kirby, "the beard in men, and the bosom in women are secondary characters, which are produced at a certain period of life, and in some instances, they are changed for those of the other sex, which does not arise from any actions at the first formation, but they take place when the great command of 'increase and multiply' ceases to operate. Thus women advanced in life are sometimes distinguished by beards, and hen birds after they have done laying occasionally assume the plumage of the cock." Mr. Kirby discovers that these cases bear a strict analogy with the expansion of the ovarium and the consequent endowment of fertility of the common bee; we confess, however, that it is by far too remote for our understanding to trace. Mr. Kirby, however, in some degree attempts to qualify the foregoing statements, but unfortunately he plunges deeper into the dilemma; for he says, "for females to assume the secondary character of

males, seems certainly a more violent change than for a worker bee, which may be regarded as a *sterile female*, to assume the secondary character of a *fertile one*."

Weak and inconclusive indeed is the argument, and tottering indeed must be the system, which has such a frail and senseless prop to support it. In the first place, this change from the character of the female to the secondary character of the male, is, in the instances adduced by Kirby, the direct effect of old age, and *after* the command of "increase and multiply" has ceased to operate. The change is not effected by the influence of some exterior agent acting upon the organic structure, and imparted to it in the very earliest stage of its existence, as is the case with the royal jelly acting upon the larva of the common bee; for it is here necessary to remark, that the change in the character of the bee takes place *before* the command to "increase and multiply" has begun to operate at all. The main question, however, still remains unsolved: neither the original sex of the man nor the woman, nor of the hen bird is changed; direct sterility is not changed into the most exuberant fertility. The man obtains not an ovary, nor is the woman divested of hers. The change in their character is the immediate effect of that decrepitude which is the invariable attendant upon old age; and in perfect consistence with the usual course of nature, the power of breeding is extinguished; but how very differently is it constituted with the working bee. The power of procreating its species was not innate in the germ of the egg, at the time of its deposition by the female bee, but the character of that egg becomes altered by an exterior process perfectly unaccountable, and inexplicable by any of the principles of analogy; and the insect comes forth at the proper period of its development, a wholly different creature than it would have been but for the administration of an extra dose of royal jelly. Kirby further says, "that the instinct of the bees teaches them that a *certain* kind of food, supplied to a

grub inhabiting a *certain* dwelling in a *certain* position, will produce *certain* effects upon it." These certainties, however, are in our estimation most decided uncertainties. We not only dispute, but we unequivocally deny the existence of any instinct in the bee relative to a particular kind of food, and in part to the administration of any food at all. It is, however, not a little remarkable, that Kirby himself characterizes the whole system as extraordinary and *extravagant*, and he says, "if you be not satisfied with the arguments and *probabilities*, recourse must be had to experiment:" we have taken the advice of Mr. Kirby; we have had recourse to experiment, and in no one single instance have the alleged *certainties* been verified.

The editor of the "Naturalist's Library," speaking of this alleged power of the common bee to generate a queen, says, "The knowledge of this singularity in the natural history of this insect is confined almost exclusively to apiarians, and even rejected by some of them. It has, however, been confirmed by so many experiments instituted by different individuals, that no unprejudiced mind can withhold its assent from the truth." We regret that Mr. Duncan has withheld from us the actual experiments of those individuals, which are so confirmatory of the truth of that singular power being vested in the common bee; for we are ourselves not aware of a single experiment which does not leave the subject in its original doubt and uncertainty; and on the other hand, as an equipoise, he should not have withheld from us the experiments and opinions of those scientific men, who totally deny the existence of that power, and who have disproved it by the most convincing arguments. It is true, he has given us the following experiment of Huber, which he considers as all conclusive; but on instituting a strict analysis of its principles, it will be found so beset with contradiction, that no reliance whatever can be placed upon its validity. Huber says, he deprived a hive of its queen,

and put into it some pieces of comb containing workers' eggs, the same day several cells were enlarged by the bees, and converted into royal cells, *and the larvæ supplied with a profusion of jelly.* He then removed these worms from the royal cells, and substituted for them as many common worms from workers' cells. The bees did not seem aware of the change; they watched over the new worms as intently as over those chosen by themselves, and closed them at the usual time. At the proper time, two queens were hatched almost at the same moment, of the largest size and well formed in every respect. Now, how will Mr. Huber account for the following circumstance? He says, that the larvæ which he inserted in the hive were duly supplied with a profusion of jelly, without which no queen can be made. He, however, removed those larvæ, and substituted others taken from the workers' cells, but to which no jelly whatever had been administered; nevertheless two queens came forth, by which it would appear that queens can be made either with or without jelly. In every other case, the administration of the jelly is a *sine qua non* in the theory of Huber; whereas Feburier, who is another very valid authority in the estimation of the editor of the "Naturalist's Library," says, "The egg of a common worker placed in a royal cell, only produces an insect, which has its powers more fully developed, in proportion to the ampler space which it occupies, *but it acquires no new powers.* The germ of the ovary existed originally in the common bee, as well as in the mother bee, but the confined limit of its cell, and the want of the peculiar food provided for the royal race, prevented its development." On this subject, Feburier and Dunbar are nearly of one accord; but when was it ever proved that the germ of an ovary existed in the common bee? The utmost skill of the anatomist has never been able to discover even the rudiments of it; and if such germ be not actually existing in the common bee, what then becomes of the experiments of

Huber and Feburier, who admit that, without the germ of such ovary being extant in the common bee, it cannot become a queen? To conclude this most interesting portion of the natural history of the bee, we are fully prepared to admit that numerous authorities are to be found of great weight and consideration, which appear to place the existence of the power of the common bee to generate a queen, on the most indisputable grounds; but, on the other hand, during a period of above forty years employed in the study of the bee, we never succeeded in a single instance of obtaining a queen manufactured by the bees from a common egg. We have challenged the staunchest adherents of the system to prove to us the verity of it by actual experiment, and not in a single instance has success attended their labours. We allowed Bonner to experimentize on every hive in our apiary, and he commenced his operations with the full persuasion that he should eventually succeed in obtaining a queen. He however failed in every one of his experiments, and he finally discarded from his system the alleged power of the bee to generate a queen from a common egg; and we reject it altogether as fallacious and fanciful, notwithstanding the bold assertion of Mr. Duncan, that no unprejudiced mind can withhold its assent from the truth of it.

Should, however, Mr. Duncan feel disposed to consult the works of the foreign authors on the natural history of the bee, and particularly on that interesting and important part of it, which treats of the power of the common bee to generate a queen, we refer him to the following, in which he will find that that alleged power is considered as directly visionary, and that the all-powerful royal jelly of Huber, as possessing any of the properties attributed to it, or even its existence at all, is denounced to be a groundless delusion, unworthy of the slightest consideration.

Observations sur les Abeilles, suivies d'un manuel pratique de la culture des abeilles, (Feuille du Cultivateur).

Mémoires sur les Abeilles, par Jean Lusac, vol. i. 8vo.

Abhandlungen und Erfahrungen der öconomischen Bienengesellschaft in Ober Lausitz, zur Aufnahme der Bienenzucht in Sachsen herausgegeben. It is rather singular that the brother of the celebrated Schirach was the editor of this work; and in no one has the system of that eminent naturalist been more minutely investigated, or his errors more successfully refuted.

Traité des Mouches à miel, ou Règles pour les bien gouverner, et les moyens d'en tirer un profit considérable par la récolte de la cire et du miel. PARIS, 1776. vol. i. 12mo.

Tratade breva de la cultivacion y cura de las Colmenas, &c. compuesto por Juy Mendoz de Terres. SEVILLE, 1748. 8vo.

In this work will be found the laws which were instituted at Seville for the promotion of the culture of the bee, and by which it was rendered imperative on every cottager to keep three hives of bees, or in lieu to pay a certain fine to the treasury of the city.

Histoire naturelle des Abeilles, par l'Abbé Bainz. BOURDEAUX, 1754. vol. ii. 12mo.

Unterrichtungen in der Bienenzucht, mit ihrer Naturgeschichte, in welchen die Entdeckungen des Herrn Huber völlig untersucht werden, mit verschiedenen Anmerkungen über das Fructifirung der Eyer der Königin. FRANKFURT, 1787. vol. i. 12mo.

This work is attributed to the celebrated Göethe. We visited his apiary at Isenburg, about five miles from Frankfort, which then consisted of about seventy hives; but there was nothing indicative either of skill or originality in their management; on the contrary, it was distinguished by many of the faults and prejudices which at that time prevailed in Germany, to the great detriment of the proper culture of the bee.

Observations de M. Dezilles sur les Abeilles. PARIS, 1789.

This work must be positive wormwood to all the disciples

of Huber. Its information is founded on direct experimental knowledge, and cannot fail to carry conviction to every unprejudiced mind, on several of the contested points in the natural history of the bee. We recommend it to the immediate perusal and to the serious study of Mr. Duncan; and should he ever be called upon to compile another work on the history of the bee, he will then perhaps hesitate before he allows himself to be so servilely led by the crude and fallacious statements of Huber.

SIXTH CHAPTER.

ON THE PURCHASE OF HIVES, AND THE ESTABLISHMENT OF AN APIARY.

GENERAL ADVICE TO PURCHASERS—DRAWBACK ATTENDING THE PURCHASE OF A HIVE—THE BEE A GREAT COWARD—EXAMINATION OF THE INTERIOR OF A HIVE—COOLNESS AND FORTITUDE REQUISITE FOR THE PROPER MANAGEMENT OF BEES—EXAMINATION OF THE EXTERIOR—SIGNS OF A DECAYED HIVE—THE SAME TO BE REJECTED—GENERAL NEGLIGENCE OF THE COTTAGERS—INTERNAL SIGNS OF AN OLD HIVE—THE NUMBER OF QUEEN CELLS, THE CRITERION OF AN OLD HIVE—TWENTY-SEVEN QUEEN CELLS, ACCORDING TO HUBER, IN ONE HIVE—AVERAGE NUMBER OF QUEEN CELLS, ACCORDING TO DIFFERENT APIARIANS—TWO QUEENS IN A SWARM (NOTE)—THE COMBS TO BE EXAMINED AS HIGH AS POSSIBLE—TO BE REJECTED IF SYMPTOMS OF THE MOTH APPEAR—PROPER SEASONS FOR THE PURCHASE OF HIVES—A FRAUD PRACTISED BY THE VENDERS OF HIVES—CRITERION OF A FIRST AND SECOND SWARM—SINGULAR INSTINCT OF A SECOND SWARM—SIGNS OF THE HEALTH OF A HIVE, AND THE FECUNDITY OF THE QUEEN—A HIVE NOT TO BE PURCHASED IN THE IMMEDIATE VICINITY—THE WEIGHT, THE BEST CRITERION OF THE GOODNESS OF A HIVE—TRANSPORTATION OF HIVES—DIRECTIONS FOR THE REMOVAL OF HIVES—ADVANTAGES OF THE TIN ENTRANCES—DESCRIPTION OF THE CONSTRUCTION OF THE TIN ENTRANCES—EXTRAORDINARY OCCURRENCE IN AN APIARY—A BATTLE BETWEEN TWENTY-EIGHT HIVES—BEES TO BE CONFINED IN TIME OF SNOW—ENTRANCES USED IN FRANCE AND GERMANY—INSPECTION OF AN APIARY AT ISENBURG—THE HAND-BARROW THE BEST VEHICLE FOR THE REMOVAL OF HIVES—A HIVE NOT TO BE CARRIED ON THE HEAD—DISASTROUS EFFECTS OF THAT MODE—THE MIDDLE OF SUMMER A BAD TIME FOR THE REMOVAL OF HIVES—THE EVENING A MOST PROPER TIME FOR THE REMOVAL OF A SWARM—METHOD OF REMOVAL RECOMMENDED BY LOMBARD (NOTE)—DIFFERENCE OF THE PRICE OF HIVES IN ENGLAND—SUPERSTITION OF THE COTTAGERS RELATIVE TO THE SALE OF HIVES—HIVES RECOMMENDED TO BE PURCHASED IN THE SOUTHERN COUNTIES, AND CONVEYED TO LONDON—RULES TO BE OBSERVED IN REMOVING A PURCHASED HIVE.

THERE is, perhaps, no article of trade in which a purchaser can be so soon deceived as in a hive of bees; and it is only the experienced apiarian who can detect the particular defects of his intended purchase. We would, therefore, always advise the novice in bees never to rely upon his own judgment in the purchase of a hive, but, if possible, to call in the assistance

of a person well experienced in bees, and who can immediately discern the intrinsic value of the hive which is to be sold.

One of the greatest drawbacks attending the purchase of a hive, is the groundless fear that persons are apt to entertain for the stings of the bees; whereas with a common veil, or any other transparent article fastened round the hat, a whole hive of bees may be managed with impunity. The bee, although an irascible insect, is a great coward; and he will, like cowards in general, bluster a great deal, but a puff of smoke will make him the most docile creature in the world.

The value of a hive can only be ascertained by a close and minute examination of its interior; for this purpose, a positive degree of presence of mind is indispensable; all flurry and hurry should be avoided; and therefore, in all the attempts of the young apiarian to manage his bees, it has been our first endeavour to impress upon his mind, that coolness and fortitude can alone insure success.

The first act of the purchaser should be to examine the exterior of the hive; if the straw be deranged and rotten, the ligaments loose, and frequent blotches appear, which evidently show that it has been mended, let him reject it altogether. It is of very little consequence that the combs be new, if the hive be rotten, and the purchaser will soon find that he has full reason to repent of his bargain, from the incessant trouble and vexation which the decayed state of his hive will cause him. The cottagers of this country are in general too inattentive to the condition of the hive in which they put their bees; and this arises from the supposition that it is of little consequence in what state the hive may be, in which they put their swarms, it being their intention to suffocate their bees at the close of the season.

The purchaser having satisfied himself with the exterior state of the hive, his most difficult part now arrives, which

is the examination of the interior. If the combs be black and ill-flavoured, it is the certain sign of an old hive; if they be of a pale yellow, it indicates a hive of the current year; but even in this point of view, a young and inexperienced apiarian may be deceived. In the common straw hive, when the combs have been extracted on either side, the bees will soon construct new ones, and from the colour of those combs, the purchaser might be inclined to consider the hive a young one. It is not, however, the side combs, but the middle ones, which should be examined, and the colour will immediately indicate the age of the hive.

Some criterion may also be formed of the age of a hive by the number of queen cells which are to be seen: if they be numerous, no doubt can exist of the oldness of the hive. In this respect, however, Huber must not be consulted as an authority; for he affirms that he has seen twenty-seven queen cells in a hive at one time, *as the generation of one season*, and *all of them with embryos in them.* The greatest number that we ever knew to be bred in a hive during one season was seven, but in this climate, five are the general average. From this hive we had three swarms, and in the first swarm there were two young queens *. We could thus account for four of the queens, but we could never discover the fate of the other three. Reaumur says, that from four to seven are the general number of queens bred in one season. Swammerdam limits the number to eight; Latreille to six; Duchet never knew more than six; Della Rocca says, that he once had eight queen cells in a hive; Bonner estimates the number at six, and

* This circumstance once occurred to us with a hive belonging to Mr. Mansfield at Nine Elms. On the swarm alighting, it was immediately hived, but the bees would not stop; we hived them again and again, but the bees always flew away: we conjectured at last that there might be two queens in the swarm, and on examination, our conjecture proved to be well founded. We took one of the queens a prisoner, until the disposition of the bees was ascertained relative to the queen which was left amongst them, when, on finding that they were satisfied with her, we, though very reluctantly, killed the superfluous queen.

Martin in one of the most favourable districts of France for the culture of the bee fixes the number at six. On the other hand, Schirach estimates the number at twenty-two; Lütterchau at nineteen, Janscha at twenty, and Kratzer at twenty-one. It must however be observed that the three latter naturalists do not affirm that all these cells were the generation of one season. We have ourselves counted twenty-four queen cells in a hive, but then the hive was four years old; thereby allowing six queens to each year. The number of queen cells is therefore a good criterion of the age of a hive, but it is a difficult one for the young apiarian to consult.

The purchaser should also examine the combs as high as possible, for it is in the upper part of the hive, that the moths begin their ravages. These vile insects are, however, seldom to be found in a new hive, and whenever the slightest symptom of their presence exhibits itself, let the purchaser immediately reject the hive; for bees can never prosper when those insects have once got a footing in their hive.

The most proper time for the purchase of a hive is either in the month of January, or at the swarming season. It is to be taken for granted, that a hive in January or February has survived the dangers of the winter; and the purchaser has then only to attend to the population of the hive, and to its apparent age. In February and March, the season has commenced for the operation of the bees, and the richness of the population of a hive is then determined by the greater or less activity of the bees. In one hive, the inhabitants will be all bustle and labour, whilst in another, a deadness and stillness will be perceptible, which demonstrate that some natural cause operates to effect a tardiness in their labours, and from such a hive an early swarm cannot be expected.

We will here mention a fraud which is often practised by the vendors of swarms, against which the purchasers cannot be put too much upon their guard. It is frequently the custom for an individual, who wishes to establish an apiary,

to bespeak a *first* swarm of some person in the immediate neighbourhood, and to send his own hive in which the swarm is to be put: at a proper time, the swarm is sent home, and the purchaser flatters himself that it is a first swarm, for he has no notion that in an affair of this kind it were possible to practise any deception upon him. Not knowing the discriminatory signs of a first or second swarm, and being informed that a first swarm generally collects a sufficiency of food for its support during the winter, the duped purchaser pays little attention to the internal condition of the hive; until before the winter is over, he finds all the bees literally dead for want of food. The real truth of this transaction is as follows; the vendor of the swarm, instead of sending the first swarm according to his agreement, has sent a second one, reserving the first for himself; well knowing that there are not five persons in a hundred, who can tell a second swarm from a first, or perhaps supposing that there is no criterion existing by which the difference can be definitively determined. We will however explain in what that criterion lies. Let the purchased hive remain for two or three days without the slightest molestation, but let the fact be ascertained by the bees carrying in the pellets of farina on their legs, that the bees have commenced the making of their combs. Let then the hive be gently lifted up, and the exact position of the combs ascertained: if they be begun in the *middle* of the hive, it is a first swarm; if the combs be begun at the side, it is a second swarm. There is a display of instinct in this circumstance, which is truly wonderful; for the insects belonging to the second swarm appear to be conscious, from their limited numbers, that they cannot fill the whole capacity of the hive and therefore for the better concentration of their heat, they only attempt to fill so much of the hive as their numbers will allow.

If a person enter an apiary, with an intent to purchase,

let him stand a few minutes before each hive, and observe the number of bees, which enter loaded with farina, and if an apparently equal number leave the hive in a great hurry and bustle. This circumstance will determine the health of the hive, and the fecundity of the queen. If a loud humming noise be heard in the interior of the hive, it is a certain sign of its strength, and that the inhabitants are in a prosperous state.

Another criterion of internal health is, when two or three bees are observed at the entrance of the hive, fanning with their wings, as if to diminish the internal heat by the process of ventilation.

A person should not purchase a hive in the immediate vicinity of his residence, as the bees are apt to return to their former place of abode; for although no fear need be entertained that the bees will ultimately forsake the hive, yet they are obstructed in their labours by a confused recollection of their former habitation, and this proves a great loss to the community. The best criterion, however, of the goodness of a hive is the weight; but in this point, a very nice discrimination is necessary between an old and a new hive: the former always contains a great quantity of bee bread, which is the heaviest substance in a hive, and the purchaser will then be deceived, for instead of honey, he has been buying bee bread, independently of being led astray in his opinion concerning the stock of provisions, which the bees may have in store for the winter. A hive in February should not weigh less than twelve or fifteen pounds; it would be imprudent to purchase a hive of an inferior weight: if purchased in the autumn, the weight should not be less than thirty pounds, one of twenty-five pounds may survive the winter; but this depends so much on contingencies, and which in general happen nine times out of ten, that without a liberal supply of food, the hive would perish before the ensuing spring.

The purchase being completed, the next and most important consideration is, the transportation of the hives to

the premises of the purchaser. If a navigable river or canal be in the vicinity, it is by far the most eligible mode of carriage, as there is no danger of the combs being broken by the motion of the vehicle. This advantage however, is so very rare to be met with, and when it does offer itself, the manner of conveyance is so very easy, as to require in this place no particular description. Land carriage is however attended with some difficulty, and frequently not without a considerable risk; the greatest precaution is therefore necessary to prevent the total ruin of the hive. The first part of the operation is to raise the hive gently, and to put it on a board in readiness for the purpose, the entrance must then be closed to prevent any of the bees from coming out, but if the distance be great to which the hive is to be carried, care must be taken not to stop up the entrance wholly, as the bees would be in danger of being suffocated; but still all egress of the bees must be prevented, as otherwise the carriers would run great risk of being severely stung. The use of our tin entrances in these cases is particularly obvious, as the two perforated sliders can be let down, and thus a sufficiency of air admitted for the respiration of the bees. We will here describe these entrances, for no bee master ought to be without them. The cost of them does not exceed fourpence or sixpence each, and in the time of pillage or of snow, or any other occasion in which the immediate confinement of the bees is necessary, they will be found invaluable. In height they are about two inches, in breadth about an inch, and in length about two inches. They are simply made of two upright slips of tin, with a transverse piece at top, in which are two nicks for the purpose of admitting the sliders. In the middle is a small upright piece in which are two grooves down which the sliders move, and which are so tight that the bees cannot force them out. There are three sliders, two of which are perforated for the admission of air, and the third is also

perforated with a hole at the bottom, sufficiently large to admit of one bee coming out at a time. In the spring and summer the sliders are taken away altogether, and are afterwards applied as the circumstances may require. The treasurer of the British Apiarian Society, of which we were the founder, had a most beautiful apiary at his seat in the vicinity of Maidenhead, and being there on a visit in the month of September, we witnessed one of the most extraordinary circumstances which ever came under our experience. The apiary consisted of twenty-eight populous stocks, all in the hives of our invention; and as if the hour and the day had been agreed upon by the whole community, a regular attack was made upon every hive, and with a fury, as if the direct extermination of the entire apiary were their object. The ground before the hives was covered with the slain, and had the battle continued for two or three hours longer, the ruin of many of the hives would have been the consequence. Fortunately however, every hive was provided with a tin entrance, and we immediately let down one of the perforated sliders, and that which had the contracted entrance by which only one bee could come out at a time; the attacking bees thus disappointed of forcing their way into the hives, and the inmates being well able to defend the entrance from its limited space, gradually relinquished the contest, and in about an hour afterwards the whole apiary was at rest. It was to the tin entrances that we attributed the salvation of the hives; the annexed drawing is a representation of them. We must not omit to state that every apiary in the neighbourhood was in the same state of commotion and rebellion; but the majority of them being under the management of the Apiarian Society, and all of them

provided with the tin entrances, the mischief was timely arrested before the ruin of the hives had been accomplished. In time of snow, when the bees ought not to be allowed to leave the hive, but which they are very inclined to do, allured by the glare of the snow, their confinement is an act of indispensable necessity. A total stoppage of the entrance would amount almost to a suffocation of the bees, but by the application of the two perforated sliders, the confinement is effected, and at the same time, a sufficient quantity of air admitted for the respiration of the bees. In France, and some parts of Germany, they affix an entrance to the hives of the accompanying form. It is made of any kind of wood not liable to warp, and moves round upon a pivot in the middle. Thus by turning it, they can have either three entrances or one, or they can confine the bees altogether; but this entrance possesses the disadvantage, that the outward air is wholly excluded, and, consequently, the bees run the risk of being suffocated. We once inspected an apiary of one hundred and twenty hives at Isenburg, in the vicinity of Frankfort on the Mayne, to every hive of which an entrance somewhat similar to the above was attached. On arguing with the proprietor on the danger impending over his bees by their too close confinement, when the entrance was thoroughly closed, the only answer we could obtain to our remarks was, "*Es thut nichts, die Bestien haben Luft genug.*" "It matters not, the creatures have air enough."

To return to our immediate subject. The entrance of the hive being properly closed, a sheet or table cloth must be then wrapped round it, and tied in a knot at the top, through which a strong pole is passed. It is then carried in that manner by two men, the hindermost one keeping it constantly steady, and no danger can then be entertained of the combs breaking. When there are two or more hives to move, the handbarrow is decidedly the most appropriate

vehicle of conveyance. We have moved half a dozen hives at a time by means of that instrument, without the slightest injury occurring to any of them. In the moving of two hives, the common yoke used by the milk people will be found an excellent mode of conveyance, and perhaps superior to any other, as the hives run no risk of being shaken, the carrier having the power to keep them even and steady.

The middle of summer is a bad time for the removal of hives, as the wax being rendered soft by the heat of the weather, the least motion is apt to break the combs, and the honey is more ready to flow from the cells, as not being so viscous as in winter *.

The most proper time for the removal of a swarm is in the evening subsequently to its being hived. The motion of the carriage or the body will then not affect the bees, and they may be carried to any distance without the least risk.

The railroads present a most expeditious and excellent method for the transportation of hives; although at the same time, we rather suspect that they are a kind of passengers, whose society would not be much courted. If, however, the proper precautionary measures be taken, no danger whatever is to be apprehended, provided the fact were once established, that the relative motion of the vehicle had no effect on the dislodgment of the combs.

The price of a hive varies much in different parts of England. In the vicinity of London, a swarm cannot be

* Mr. Lombard mentions a circumstance which shows the facility with which hives can be moved from the 1st of November to the 15th December, and from the 1st of February to the end of March. In the month of February 1832, one hundred and five hives were placed on a carriage at *Roche Abeilles*, in the commune of Limousin, in the department De la Haute Vienne. They were fifteen days on the road, and after a journey of one hundred miles, during which the carriage broke down, they arrived in a good state, with the exception of four or five, the combs of which were broken, probably owing to the breaking of the carriage. He examined a number of these hives; they were made of osier of the bell shape, and weighed from forty to ninety pounds each. They were buried in straw topsy-turvy. The fixed habits of the bee almost put a decided negative upon the latter circumstance.

purchased under fifteen shillings or a pound, whereas in the more western and southern counties it may be obtained for five or seven shillings—that is, if the cottagers can be induced to sell them at all. There is a ridiculous superstition prevalent amongst the country people, that it is unlucky either to buy or sell a hive of bees. "I'll *swap* with you," said a cottager to us in the vicinity of Chelmsford, from whom we wished to purchase some hives, for the purpose of establishing an apiary on account of the Apiarian Society, "but," we answered, "we have not got anything to swap with you." "Then," said the cottager, "go and buy something." We bought a pig, and obtained our hives. We are certain that it would be a most profitable speculation to purchase the swarms in the southern counties, and convey them to the vicinity of London. We know of only one person, living at Islington green, who professes to deal in bees. There cannot remain a doubt that within the circumference of ten miles from London, ample food and provision might be found for 2000 hives, and we do not suppose that 200 could be mustered.

It may be necessary to remark, that on lifting the purchased hive from the platform for the purpose of removing it, a number of bees will be generally found upon it, which however must not be left behind. In this case, get two or three small stones, and let the hive rest upon them; the wind passing through, will in a few minutes drive the bees up into the hive, and the removal can then take place without the loss of a single bee.

SEVENTH CHAPTER.

ON THE POSITION OF THE APIARY.

DIFFERENT POSITION OF HIVES—LITTLE ATTENTION PAID TO ASPECT IN ENGLAND—VISIT TO AN APIARY AT EAST GRINSTEAD—THE ASPECT OF THE APIARY TO VARY WITH THE CLIMATE—THE HIVES TO BE PROTECTED FROM THE WINDS—SINGULAR ANECDOTE RESPECTING BEES BY L'ABBÉ DELLA ROCCA—THE HIVES IN AN APIARY TO BE PLACED IN A STRAIGHT LINE—HEIGHT OF THE HIVES FROM THE GROUND—THE HIVES FOR WANT OF ROOM MAY BE PLACED DIAGONALLY—THE ADVANTAGES OF THE SINGLE PEDESTAL—MACHINE FOR THE PROTECTION OF HIVES AGAINST ROBBERS—THE PLATFORM OF THE PEDESTAL TO BE MADE OF WELL SEASONED WOOD—THE WARPING OF THE PLATFORM TO BE PREVENTED—THE ASCENT INTO THE HIVES BY THE ENEMIES OF THE BEES TO BE PREVENTED—ERRONEOUS CUSTOM IN SUSSEX—LOSS OF A WHOLE APIARY BY BAD MANAGEMENT—THE APIARY TO BE KEPT REMARKABLY CLEAN—NOT TO BE INCOMMODED BY TALL HERBS OR SHRUBS—PROTECTION AGAINST THE ANTS—SHEEPS' SKIN TO BE PUT ROUND THE PEDESTAL—THE PEDESTAL TO BE CLEANED FOUR TIMES A YEAR—ANECDOTE OF A MOUSE IN A HIVE—THE VICINITY OF GREAT TOWNS NOT A PROPER SITUATION FOR AN APIARY—HIVE OF MR. SAUL HAVING A CONTINUAL CHANGE OF ASPECT—PROXIMITY OF LARGE RIVERS INJURIOUS TO BEES.

An apiary is the spot in which the bee hives are assembled. Some persons prefer the open air for their hives, whilst others place them in houses, constructed according to their particular skill or taste. In the southern countries of Europe, the aspect is always to the eastward, in the more northern countries it is always to the eastward and the southward, but in England little or no attention is paid to it During a perambulation through Hampshire, we saw the bee hives facing all the points of the compass; and in one garden, in which there were fifteen hives, not two of them had the same aspect.

In the vicinity of East Grinstead, we visited a farmer, who had a small apiary consisting of about five hives, the aspect of which was due north, and the hives were ranged

over a pigstye. We expostulated with him on the badness of the situation, and remarked to him the particular dislike which bees entertain to an offensive smell. The answer, which we received was, that his bees had been in that situation for about four years; that they were now accustomed to it, and were he to remove them, they would regret the change. We made use of every argument which our experience in bees could suggest; we tried him on the principle of personal interest; but all was in vain. The bees, he knew were attached to the north and the pigstye, and therefore they were not to be removed.

There cannot be a doubt that the aspect of the apiary should vary with the climate of the country; but in this climate, it should be in the proportion of two points to the eastward and one to the southward. The variable temperature of our spring being such, that there are some days in which the honey harvest is wholly obstructed, it is good practice therefore to place the hives in that position, which will enable the bees to go early into the fields, on those days when the flowers abound with honey, because at that time they will be able to make a more abundant harvest, than when the heat of the day has absorbed the mellifluous juices from those flowers, on which a multitude of other insects, particularly the bumble bee, have alighted since the morning.

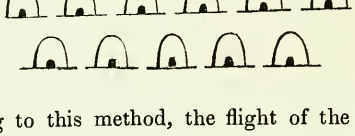
In whatever position the hives are placed, they should be protected from the winds. In this country, therefore, a protection from the south west is advisable. The high winds not only prevent the bees from leaving the hive in quest of honey, but they also surprise them when employed in their labours, and often kill them by dashing them against the trees and rocks, or into the rivers. The following anecdote is curious and amusing: it is related by the Abbé della Rocca, whose veracity is in general unimpeachable, but whether it be so in the present case must depend

on the credulity of the reader. "One day," he says, "I was sitting on the top of a mountain, on which the wind raged with the greatest violence. I saw a number of bees which came to gather the honey; the north wind blew with violence, but as soon as the bees presented themselves, they were repulsed, and their resistance was useless: fatigued with this eternal combat, many of them fell upon an expedient, which I had never heard mentioned, but of which I had read in books; *they collected some little stones, and taking them up with their feet, they took their flight afresh, and succeeded in their design.*"

The hives in an apiary should always be placed in a right line, about four or five feet apart, but should the number of the hives be great, and the situation not capacious enough to admit of their being placed longitudinally; it is more advisable to place them over one another, than in double rows. A bee on leaving the hive, supposing his flight to be unobstructed, generally forms an angle of about forty-five with the horizon; particular care therefore should be observed, in having the space clear before the hives, a point of practice to which in general very little attention is paid. The hive should be placed about two feet from the ground, in order to protect it from humidity. The greater the height of the domicile of the bees, the more distant is the flight of the swarm, and when they are at a certain point of elevation, the swarms are generally lost to the proprietor *. If the hives are to be placed in a double row, the hinder ones should be at that distance from the front ones, that when the bees depart from the hive, no obstruction be offered to their flight; at all events, if the situation will not allow of

* In a memoir addressed to the Society of Agriculture of Paris, an apiarian, speaking of a swarm that had lodged themselves in an elevated part of his house for eighteen years, says, "this hive has uniformly sent forth a number of swarms, which however have always escaped; because the height of the place from which they direct their flight, facilitates their removal to a great distance."

the hives being placed on a right line, they should be ranged in the form of a chequer thus—



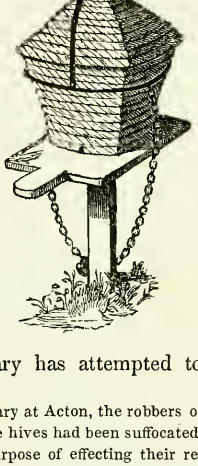
According to this method, the flight of the bees in the hinder row will not be obstructed by those in the front.

The plan which is often adopted, of placing several hives upon the same bench is very injurious, and during the swarming season, it is often attended with very destructive consequences; for the easy access which the bees of one hive have to those of another, is sure to lead to quarrels and murderous battles. It is an erroneous opinion, though maintained by some skilful apiarians, that all the bees of one apiary know each other, and that it is only with the bees of a strange apiary that they quarrel. We have been too often a witness of the destructive animosity of these winged amazons, and the wars which they wage upon the weaker hives of their own establishment, not to impress it strongly upon the attention of every keeper of bees, to place every hive upon a respective pedestal. In general, a post is placed at each corner of the stand, as some prejudiced people believe that a hive stands firmer upon four feet than upon one. The numerical power, we grant, is against us, but we are certain that they who have once used the single pedestal, will never have recourse again to the four-legged stool.

There is another advantage, and no trifling one, which arises from the use of the single pedestal.

We have reason from sad experience to know, that the bear is not the only animal which robs an apiary, for there is a two-legged animal of a disposition still more vicious; for if the bear attacks the apiary, he satisfies himself with the honey, but leaves the hive and the bees; but the two-

legged animal takes honey, hive, and all*. We had so frequently suffered from the depredations of this animal, that we determined to devise those means, by which our property might be protected. We therefore adopted the following plan. The pedestal on which we place our hives is about three inches in diameter, through which a hole is bored of sufficient extent as to admit a chain of a tolerable size. We then place the machine, which is made of strong iron hoops, over the hive: the longer end of the chain is passed on one side through the hole and meeting in the other, a good strong padlock is attached, which unless the aforesaid animal be an adept in the picking of locks, imparts security to our property. The annexed drawing is a representation of our hive, as it stands in the garden with the protecting machine affixed to it.



The editor of the Naturalist's Library has attempted to

* We had once three hives stolen from our apiary at Acton, the robbers of which were detected and taken into custody. The hives had been suffocated, and were properly secured with cloths for the purpose of effecting their removal. On the following morning, the culprits were taken before the magistrates at Marlborough street police office, and for the purpose of identifying the hives, the cloths were ordered to be removed from them. It appeared that the suffocation had not been completed, for a number of bees had recovered during the night, and the cloths were no sooner removed, than the bees sallied forth to enjoy the freshness of the open air. The office was soon filled by the unwelcome intruders—the magistrates were thrown into consternation, the clerk hid his head under the table, the valiant officers ran out of the office, followed by the reporters, witnesses, jailors, constables and all the unsoaped idlers of a police office,—the most abusive epithets were cast upon the poor bees, and upon those who brought them thither. All business was suspended; whilst to us it was a scene of merriment and amusement to see a whole police office thrown into commotion by a few dozen bees, which had the windows been opened would have rejoiced to effect their escape, rather than run the risk of being committed by the magistrates as a posse of lawless vagabonds.

ridicule the utility of this protecting machine on the ground that the robber, *if he pleases*, can carry away the hive and the whole apparatus, with apparently little trouble. Now we will inform Mr. Duncan, that it was in his native land that we first found it necessary to protect our hives from the depredations of the nightly robber, for there was scarcely a season that we did not lose four or five of our best stocks by pillage; but we never lost one when the machine was affixed to it. The only implements which the robbers of hives carry with them are a tinder box and some bundles of matches; and in order to obtain possession of their intended booty, they have simply to apply the ignited sulphur underneath the hive, and the property becomes their own. In order, however, to obtain possession of a hive with our machine affixed to it, they must bring with them a bunch of skeleton keys and a saw, and it is not very probable, that a thief who has planned the robbery of an apiary, would come provided with those implements, when he supposes, that a light and a little sulphur would be all sufficient to accomplish his design. A robber would find it no easy task to carry off a hive with the machine affixed to it; for independently of his not being able to suffocate the bees, the weight of the hive, added to that of the pedestal and the machine, would prove almost an insurmountable obstacle to its removal.

We however recommend that the board on which the hive is to stand, should be nailed to the pedestal in a very firm manner, but rather slanting towards the front, that a fall may be given to the rain, and thereby obviate the danger of any humidity to the hive. We have often seen that the board on which the hive stands has been made of such thin unseasoned wood, that it becomes warped as soon as the warm weather sets in. This circumstance, trifling as it may appear at the first view, has been often attended with very serious consequences to the hive, for if its whole circumference does not rest on the board, the open parts grant

a ready admission to wasps, or any other insidious enemies of the bees, who being too much of the coward to enter the hive by the regular passage, are rejoiced to find any secret opening by which they can penetrate into the hive, and carry on their marauding actions without fear of discovery. The best method of preventing the warping of the stand, is to have two strips grooved in contrary to the grain of the wood of which the stand is made; it will then always remain even.

Every object should be carefully removed by which the enemies to the bees can ascend into the hives. This however appears to be an object of trifling consideration, or of no consideration at all, to the majority of the keepers of bees. A farmer will often protect his poultry from the depredations of the fox or the polecat; he will protect his dovecote from the visitations of the cat; but as to his bees, he often places them in such a situation, that it is actually inviting to their enemies; and he even appears to tax his ingenuity to devise those means, by which the ascent into the hives can be the better accomplished. In some counties of England, the hives are placed extremely low, and by way of assistance to the mice, toads, earwigs, and other enemies of the bee, a piece of board, like an inclined plane, is placed from the opening down to the ground. In Sussex, this plan is generally adopted; and once on passing through that county, we stopped at several cottages, where we saw the above plan adopted, and reasoned with the proprietors on the injury which must necessarily arise to their bees, by an adherence to such an injurious practice: but, to our great mortification, the hives generally belonged to, and were under the management of the female branches, particularly the elder ones of the family, who were so strongly devoted to the old method of managing bees, that they literally looked upon us as a person who knew nothing at all about the business; and our ignorance was the greater in proportion as our advice

departed from the long established custom of the country. During our perambulations, we once entered a cottager's garden, in which were about fifteen hives, literally on the ground, with the exception of a slight intervening board, which was rotten and cracked. We expostulated with the clodpole on the injury which his hives must necessarily experience from such a bad system of management, and, unfortunately for our character, we predicted the total ruin of his hives. For the purpose of effecting conviction on his mind, we lifted one of the hives, and showed him that the combs were completely mouldy, and totally unfit for either breeding or the reception of honey. He appeared to see the force of our reasoning, and determined to place his hives on pedestals. This plan was accordingly adopted, but in two months, he had only two stocks remaining, the bees of the other hives having forsaken their domicile as untenantable. We were immediately invested with the character of some malignant witch, who had intruded himself into his garden, for no other purpose than to bewitch his bees; the two remaining stocks were removed from the pedestals, and returned to their former situation, but they also soon died; and the loss was attributed to some witchcraft on our part, for it could not possibly be, according to the opinion of the cottager, the effect of a bad system of management.

The apiary should be kept particularly clean, all noxious weeds carefully removed, and no rubbish be left in which the enemies of the bees can conceal themselves. A few low trees or shrubs planted in the vicinity of the apiary will be found useful in arresting the flight of the swarms, for they very often alight on espalier trees, or on currant and gooseberry bushes.

It is, however, essential to observe that the apiary should not be incommoded with herbs, nor plants, which rise to a height equal to or exceeding the entrance of the hive, because the bees, on arriving from their journey, being much

fatigued, are impeded by those plants, and regain their habitation with difficulty. If they touch those plants in passing, they often fall to the ground, and become victims to their enemies, or are unfortunately trodden under foot. Those plants serve also the purpose of a ladder, whereby the enemies of the bees can ascend into the hive, and particularly the ants, which in some districts are particularly numerous. These little insects are a great detriment to a hive, and they baffle the most vigilant attention of the apiarian to prevent their depredations. We have found that a small leaden reservoir of water placed at the bottom of the pedestal is of great service in preventing the ascent of these insects. A still cheaper preventive is, however, to be found in fastening a piece of sheep skin with the wool on, sprinkled with pitch or tar, round the bottom of the pedestal. The ants and earwigs are not able to overcome this obstacle, and even the mouse itself will feel some reluctance to defile its paws with the adhesive unguent.

The pedestal on which the hive is placed should be often cleaned, that is, about four times in a year. The first cleaning should take place at the commencement of the spring, for a great deal of trouble will be thereby saved to the bees, who are of that cleanly nature, that they will not endure any obnoxious substances in the hive, and thus a portion of time is sometimes very unprofitably spent by the bees in clearing away extraneous matter, which the apiarian could brush off in a moment. An extraordinary instance of the instinct of the bees in the removal of any offensive object from their hive is on record, in the circumstance of the mouse, which had made its way into a hive, and was most likely stung to death by the bees. The removal of the corpse of the animal was a direct impossibility, and therefore rather than endure the effluvium of his putrifying body, they covered it over with a thick coating of wax, and thereby prevented the emission of any unpleasant odour.

The vicinity of great towns is not a proper situation for an apiary. The smoke of a city is very detrimental to bees, and the chimneys are in general the resort of swallows and martins, who are great destroyers of the bee.

The proximity of a large river is also injurious, as the bees in their homeward flight are often dashed into it by the high winds, or fall into it from fatigue.

On the subject of the aspect of a hive, we may be allowed to make mention, though perhaps not a very respectful one, of a hive invented by a Mr. Saul of Lancaster, which is so constructed, that it is made to move in the centre on a pivot, the motion of which is regulated by a vane, and the aim of this motion is, that the entrance of the hive shall always be directly opposite to the quarter from which the wind blows. Thus, the hive of Mr. Saul has no positive aspect at all, for in the morning it may face the north east and before the evening, it may face the south west. The bees on leaving the hive may have an aspect facing the north; during their labours in the field, the wind may change, and on their arrival at home, the aspect may be due south, and the bees are thus thrown into the utmost confusion, as not knowing where to look for the entrance into their hive. The south west is the most prevalent wind of our summers; during that season then, the aspect of Mr. Saul's hive will be north east, the worst of all aspects for a hive. On the whole, we consider this hive to be one of the wildest inventions, which was ever engendered in the head of an apiarian.

EIGHTH CHAPTER.

ON SWARMS IN GENERAL.

DIFFERENCE OF THE TIME IN WHICH THE BEES THROW OFF THEIR SWARMS —PERIOD OF SWARMING IN ENGLAND, FRANCE, ITALY, AND SICILY—PROGRAMME OF A SWARM—DIFFERENCE BETWEEN THE BEES OF A SWARM AND THOSE OF THE OLD HIVE—QUANTITY OF HONEY WHICH A SWARM CARRIES ALONG WITH IT—WEIGHT OF SWARMS—SIGNS PRECEDING THE DEPARTURE OF A SWARM—IMPLICIT CONFIDENCE NOT TO BE PLACED IN THEM—THE CLUSTERING OF BEES ARISES FROM DIFFERENT CAUSES, EXEMPLIFIED IN A CASE AT WIMBLEDON—JOY, THE CAUSE OF THE VIBRATION OF THE BEES—QUESTION RELATIVE TO THE NOISE MADE BY A QUEEN PREPARATORY TO THE DEPARTURE OF A SWARM—REASONS ASSIGNED FOR IT BY THE GERMAN APIARIANS—ROMANTIC STATEMENTS OF HUBER—THE BIRTH OF A QUEEN BEE, AN IMPORTANT EVENT IN THE MONARCHY OF THE BEES—DEPORTMENT OF THE BEES ON THE BIRTH OF A QUEEN—THE BEES, ACCORDING TO HUBER, IMPRISON THE QUEEN—THE QUEEN MALTREATED BY THE BEES—THE QUEEN POSSESSED OF THE POWER OF EMITTING A PIPING SOUND—THE POWER OF HUBER TO WITNESS THE MOTIONS OF THE BEES DESCRIBED BY HIM, DENIED—NATURAL TIMIDITY OF THE QUEEN—THE YOUNG QUEEN PROCEEDS TO MURDER THE REMAINING QUEENS—PREVENTED BY THE COMMON BEES—A NATIONAL GUARD FORMED BY THE BEES—LUDICROUS DESCRIPTION OF THEIR TREATMENT OF THE QUEEN—EXTRAORDINARY POWER INVESTED IN THE QUEEN OF PLACING HERSELF IN SUCH AN ATTITUDE AS TO STRIKE THE BEES MOTIONLESS—STRICTURES ON KIRBY AND RENNIE—HUBER'S DESCRIPTION OF A SWARM—THE QUEEN SEIZED WITH AN AGUE FIT—CAUSED BY AN INCREASE IN THE NUMBER OF ROYAL CELLS—THE BEES SEIZED WITH THE AGUE RUSH OUT OF THE HIVE—THE SWARM FORMED ACCORDING TO HUBER—THE SWARM NOT ATTENDED BY THE QUEEN—THE QUEEN TAKEN PRISONER BY THE BEES—NO SWARM WILL SETTLE WITHOUT A QUEEN—THE SWARM PRODUCED BY THE INCREASED TEMPERATURE OF THE HIVE—CAUSES OF THE PIPING OF THE QUEEN—THE QUEENS LIBERATED ACCORDING TO THEIR RESPECTIVE AGES—DIFFERENCE OF SOUND IN OLD AND YOUNG QUEENS—THE DEPARTURE OF A SWARM A GRATIFYING SIGHT—QUESTION RELATIVE TO THE BEES, SENDING OUT AN ADVANCED GUARD—VERIFIED BY MR. KNIGHT AND ST. JEAN DE CREVECŒUR, BY DUCHET AND DUCARNE—REMARKS OF DUBOST—LAW RELATING TO PLACING AN EMPTY HIVE IN A GARDEN (NOTE)—NEW SWARMS NEW HIVES CULPABLE NEGLECT IN NOT PROVIDING PROPER HIVES—NEW HIVES TO BE CLEARED OF ALL PROJECTING STRAWS—DIRECTIONS FOR HIVING A SWARM—PLANS ADOPTED BY THE COTTAGERS TO MAKE A SWARM SETTLE —THE GARDEN ENGINE RECOMMENDED BY MARTIN—COVERING TO BE USED BY THE PERSON ON HIVING A SWARM—FRYING-PANS AND OTHER INSTRUMENTS RECOMMENDED BY WILDMAN—ORIGIN OF THE CUSTOM—LAW RESPECTING SWARMS—SUBSTANCES WHEREWITH TO RUB THE INTERIOR OF A NEW HIVE—LEAVES OF GARLIC AND ONIONS RECOMMENDED BY THE FRENCH AND ITALIAN APIARIANS—OBJECTED TO BY L'ABBÉ DELLA ROCCA—SIGNS OF THE QUEEN NOT BEING IN A SWARM—METHOD OF REMEDYING THE EVIL—SEVERAL QUEENS IN A SWARM—THE SUPERFLUOUS QUEENS TO BE TAKEN AWAY—SYSTEM OF LOMBARD AND

DUCOUEDIC—JUNCTION OF SWARMS FROM DIFFERENT HIVES—SYSTEM TO BE ADOPTED—THE WEIGHT OF A SWARM THE CRITERION OF ITS VALUE—WEIGHT OF SWARMS—SECOND SWARMS—SIGNS OF A HIVE NOT THROWING OFF A SECOND SWARM—THE SUPERFLUOUS QUEENS KILLED BY THE BEES—THE QUEENS TAKE NO PART IN THE MASSACRE OF THE YOUNG QUEENS—THE ROYAL DUELS OF HUBER—DESCRIPTION OF A DUEL—CONDUCT OF THE BEES TOWARDS THE VICTORIOUS QUEEN—THE CAUSE OF IT ASCERTAINED BY HUBER—ITS REMOVAL—HUBER'S OPINION OF THE DISCOVERIES OF SCHIRACH AND REIMS—THE PRETENDED DISCOVERIES OF HUBER CONSIDERED AS IMPOSSIBLE—SITUATION OF THE ROYAL NYMPHS IN THE CELL—THE ROYAL NYMPHS STUNG TO DEATH BY THE FIRST BORN QUEEN—CONTRADICTIONS OF HUBER RELATIVE TO THE EXTRACTION OF THE STING—THE BODY OF THE BEE IMPERVIOUS TO STINGS—SINGULAR METHOD ADOPTED BY THE BEES TO KILL A QUEEN—THE ROYAL DUELS OF HUBER DENIED BY DUNBAR—PROBABLE DEATH OF THE QUEENS OF TWO SWARMS A SECOND SWARM SELDOM WORTH PRESERVING—COMPARATIVE ADVANTAGES OF A FIRST AND SECOND SWARM—JUNCTION OF SECOND SWARMS—SYSTEM OF BONNER IN THE JUNCTION OF SWARMS—ITS DEFECTS—PRACTICAL SKILL OF THE GERMAN APIARIANS—THE BEES RECOGNISE EACH OTHER BY THE SMELL—SINGULAR CUSTOM ADOPTED BY THE GERMANS ON THE INTRODUCTION OF A QUEEN—JUNCTION OF SWARMS BY PARTIAL DROWNING—TWO SWARMS WORKING TOGETHER IN THE SAME HIVE—CURIOUS STATEMENT OF MR. GAGNIARD RELATIVE TO THREE SWARMS—FOOD TO BE ADMINISTERED TO WEAK SWARMS—THE HIVING OF A SWARM ON THE GROUND—SYSTEM OF MARTIN ON THE PROTRACTED CLUSTERING OF THE BEES—METHOD OF STRENGTHENING A WEAK HIVE—THE SWARM OF A SWARM—REMARKS OF L'ABBÉ TESSIER—A SWARM TO BE PREVENTED FROM SWARMING—VIRGIN SWARMS—ARTIFICIAL SWARMS—OBJECTIONS TO THEM—PLAN OF WILDMAN, OF SCHIRACH—METHOD OF FORMING ARTIFICIAL SWARMS IN THE HUISH HIVE—PLAN RECOMMENDED BY DUCARNE—APPARATUS TO BE WORN IN ALL APIARIAN OPERATIONS—EFFICACY OF SMOKE IN THE MANAGEMENT OF BEES—GENERAL REMARKS.

In regard to the time in which the bees throw off their swarms, it differs according to the climate of the country. We learn from Mr. Mentelle, that the hives in the island of Cuba throw their swarms during the whole of the year, and Don Ulloa says that a swarm, and sometimes two, are cast every month ; in Europe, however, the spring or the beginning of summer is the time when the swarms appear, but this is in all cases regulated by the forwardness or backwardness of the season.

In England, the swarms generally appear in the months of May and June. We have, however, known a swarm in the vicinity of Stirling in Scotland as early as the 24th of April. In France, the time of swarming is generally computed from the 15th of May to the 15th of June, according to the forwardness or backwardness of the season. In Italy, the swarms take place about the first week in May, and not unfrequently in the latter end of April. In Sicily, the

swarms appear the latter end of April. It is therefore evident that the departure of the swarms depends on the greater or less mildness in the temperature of the climate, and on the particular state of the weather.

The following may be considered as the programme of a swarm. The young bees or the brood having emerged from the cells in which they were bred, the old ones commence immediately to clean them, divesting them of all extraneous matter which they may have brought with them from their cells, and supplying them at the same time with some honey by means of their proboscis. The young bees then descend to the pedestal of the hive, in order to accustom themselves by degrees to the air ; afterwards they venture to the outside of the hive, enjoying themselves in the sun, and appearing to welcome home their brethren from their labours. A young bee is always known by the manner in which he takes his first flight from the hive. An old bee rushes out of the hive, and darts off immediately, whereas a young bee always turns his head to the entrance of the hive, takes to its wings, and hovers about for some time before it takes its departure. In proportion as the young bees gather strength and confidence, they extend their flights into the fields, begin to collect honey and pollen, and after having served a kind of apprenticeship, they become as skilful labourers as their elder brethren. The young bees may now be considered in a condition to depart with the first young queen, who may be ready to place herself at their head; and on her appearance from the royal cradle, they appear as if to deliberate on their approaching separation from the mother hive, and to become the subjects of a newly founded monarchy.

The following is an extraordinary trait in the character of these insects, exhibiting the power of instinct in an astonishing light, and showing a power of foresight scarcely conceivable in so small a creature. Let an individual weigh five hundred bees, which have just left the hive, as the part

of a swarm, and five hundred of the old members left behind in the hive, and the former will outweigh the latter by at least ten or twelve ounces, and this difference arises from the following circumstance. The bees which are to compose the swarm appear conscious of the journey which they have before them, and of the chance of being exposed to hunger, before they may have the opportunity of collecting any food in the fields. Some therefore gorge themselves with honey, whilst others fill their stomach with the farina, for the purpose of constructing their cells : nothing is more easy than to know and distinguish a bee, which has satisfied its appetite, and one which has been living, as it were, upon short commons. Take the bee of a swarm, and one of the parent hive ; crush them : the former will be found full of honey, the latter with scarcely any, except it has just arrived from the fields with its booty. The truth of these remarks is verified by the labours of a swarm put into a new and empty hive, on the occasion of some severe weather coming on immediately after their being lodged in the hive. No doubt whatever then exists, that before their departure from the parent hive, they had taken the precaution to provide themselves with such a stock of provisions as to protect them from immediate want. The quantity of honey which a swarm carries along with it for its sustenance, has been ascertained from the following curious circumstance. In some countries, particularly to the south and south-east of Europe, it is customary to put a swarm into a bag ; and this originates from the propensity of the bees to lodge themselves in the woods, in which it is the office of certain persons to collect the swarms. A person having once collected a swarm in a bag, suspended it to the branch of a tree whilst he went in search of some other swarms. The swarm being exposed to a most ardent sun, the bees were suffocated with the heat, but more than three pounds of honey were collected, leaving some behind.

We give the above story, on the authority of an article published in *les Archives des Découvertes:* we do not however give our unqualified assent to it: on the principles that the enclosing of a swarm of bees in a bag is an operation almost impracticable, and the man who attempts to execute it must have a method of handling those insects, to which we admit we are decided strangers: and, secondly, that it is a good swarm, which consists of three thousand bees, the weight of which, we calculate to be about three pounds; if then a swarm will yield three or four pounds of honey, the swarm must weigh about seven or eight pounds, a weight unknown in this country. Ducouedic indeed affirms that he has had swarms from twelve to eighteen and even twenty pounds!! We may be permitted to express our disbelief of this report of Mr. Ducouedic; at the same time, we allow that we have seen swarms in Switzerland and the south of France, which would in this country be held as direct phenomena. A swarm of twenty pounds' weight would comprise a population of above twenty-five thousand bees, the eggs of which must have been laid by one queen bee in the space of a few months, independently of the eggs, embryo and young bees still remaining in the hive; a computation which exceeds all credibility.

The most important points with which a young apiarian should make himself acquainted, are the signs which generally present themselves for some days previously to the actual departure of the swarm, and they may be reckoned six in number. 1st, An extraordinary number of bees which hang in clusters about the entrance of the hive; 2nd, an apparent idleness amongst the bees, as if a temporary cessation from all labour had been agreed upon, 3rd, an unusual bustle amongst the drones. 4th, A sudden silence succeeding a violent uproar. 5th, The continual motion of the wings of the bees, which stand at the entrance; and 6th, violent commotions at the entrance of the hives, the bees

crowding out in great numbers, and hurrying to and fro, as if in search of some particular object.

Implicit confidence however must not be placed on any of these signs; for although they are certainly the prognostics of an approaching swarm, yet they may, and also do happen at other seasons when there is no prospect of a swarm; the clustering of the bees will for instance take place when the heat of the interior of the hive is too great, or when the bees have not sufficient room in which to work. In regard to the latter circumstance, the cottagers are very apt to be deceived, of which we had a very striking proof with some hives, which we intended to purchase at Wimbledon. It was in the month of August, and going into the garden of the old woman, we perceived the bees lying out of two of the hives in great clusters and apparently wholly inactive; underneath the platform of one of the hives there was a large cluster of bees, on which some were observed to alight with the pellets of farina on their legs. The old woman proceeded to inform us that she had been now watching during three weeks for the swarms, for as the bees were hanging out in such large clusters, no doubt whatever existed that a few days would give her an addition to her apiarian family. We ventured to dissent from the opinion of the old lady, and of course, she was convinced that we knew nothing at all about the matter. We assured her, that her hopes of a swarm were wholly fallacious, as the cause of the clustering of the bees arose solely from the want of room in the hive. She expressed her entire doubt of the truth of our opinion; but being convinced that the bees which had clustered under the platform were there carrying on their works, we moved a few of the bees, and showed her the combs. She was now convinced; we placed two ecks under the hives, and in less than half an hour, no portion of the cluster of the bees was to be seen. Thus, the old woman in the expectation of her swarms had lost many pounds of honey.

The cause of the motion of the wings of the bees, which is so rapid that the wings themselves cannot be distinguished, has long been an object of investigation amongst naturalists, and, as may be supposed, it has been attributed to various causes. It has been generally ascribed to a habit of the bee, desirous to promote the circulation of air, and thereby mitigate the heat of the hive; we are, however, inclined to attribute it to an expression of joy. We have experienced this so often after the recovery of bees chilled with snow, or suffocated in any glutinous substance, even in honey itself, as almost to set all doubt at rest on that subject. On a summer evening, ten or a dozen bees will be often seen standing in the attitude of fanning with their wings, and some of them at that distance from the entrance, that no possible benefit could accrue from the motion; we, however, never returned a chilled or a recovered bee to the hive, but it immediately began to express its joy by fanning its wings; and in fact, when we have had forty or fifty bees in a tumbler before the fire, recovering them from the torpor occasioned by the cold, we could always tell to which hive the bees belonged, by the motion of their wings as soon as they were put to the entrance.

We will here disabuse the mind of all apiarians of the prevalent opinion, that the queen bee makes a chirping or any other noise preparatory to her placing herself at the head of a swarm. The German apiarians give a singular reason for the notes, which are alleged to be uttered by the queen, for they assert that this noise denotes the existence of some rival queen in the hive, who at the moment when the mother queen is in the act of coition with a drone, makes a chirping shrill noise as a mark of jealousy and envy.

The queen is in reality destitute of all organs of sound. In the perusal, however, of the following account, which Huber gives of the departure of a young queen with a swarm, all gravity must be laid aside, but at the same time, a deep feel-

ing of regret must be expressed, that the natural history of the bee should be loaded with such a mass of absurdity; and that men can be found at the present day, who, being employed in *the diffusion of useful knowledge,* can combine to uphold such a system of romantic fiction and fallacy, and unblushingly pretend that it has been confirmed by personal experiment. The lash of ridicule is generally smarting and effective; but in the present instance, it ought to be steeped in the strongest brine, and applied to the individuals above alluded to with the most unmerciful severity; nor can we entertain the slightest doubt, that after the perusal of the following statements, declared by Huber to have been verified by himself, and acknowledged to be true by some pseudo-apiarians of the present day, we shall be fully sanctioned in our exposure of such a tissue of falsehood and of the grossest improbability.

The birth of a queen is a momentous day in the monarchy of the bees, as it is the immediate forerunner of one of the greatest events in their government, which is the emigration of a few thousand young and enterprising subjects, to establish a kingdom of their own at a distance from the parent monarchy. The precise day and hour in which a young queen leaves her cell, have been considered by all apiarians as a calculation not easily made, if, indeed, it could be made at all. Huber, however, bounds over difficulties of that kind with the greatest facility, and, accordingly, he made a calculation of the precise hour, in which her youthful majesty was to emerge from her cell; and not only was the precise time ascertained, but he also informs us that the waving of the cell was so deep, that everything that passed within was, to quote his own words, *pretty perceptible,* which in reality may be called a case *sui generis,* for it never happened before, and we will venture to predict that it will never happen again, that a cell of a queen, which is always of a thick and opaque substance, should for the particular accom-

modation of Mr. Huber be for once of such a transparent nature, as to render the motions, evolutions, and transformations of its royal tenant *pretty perceptible.* Huber, however, suspecting that some cavillers, like ourselves, might be disposed to cast a shade of doubt over the veracity of his statements, deems it necessary to impart the information, *that his discernment in this respect was quite clear,* and in the first place *he saw* that the silk of the cocoon was cut circularly, but in this early stage of the emancipation of the young queen, in what manner did the bees deport themselves? According to her own judgment, the young queen was in every respect fully prepared to leave the cell; her organic structure was complete, and she was in a proper condition to put herself at the head of the swarm and to perform the important functions of her nature. The bees, however, from a perverseness of disposition, or from some other cause, which Mr. Huber very properly acknowledges he could not discover, had made up their minds, that her majesty had formed a wrong judgment of her condition, and consequently that she ought to be thwarted in her intentions of leaving her cell; they therefore, in a very disloyal and uncourteous manner, proceeded to imprison her majesty in the cell, by soldering up the orifice with some layers of wax. This Mr. Huber admits to have been a most extraordinary act on the part of the bees, in which we do most perfectly agree with him; but with all the gravity becoming the man who was about to astound the world with the discovery of a most important fact, Mr. Huber proceeds to inform us, that the queen no sooner found herself thus rudely treated by her future subjects, than she set up a very distinct sound, a kind of piping, or humming, the organ of which sound Mr. Huber very justly and truly observes, he has not yet been able to discover, and which we will venture to pronounce is very like the north-west passage, decidedly undiscoverable. Progressing however in his description of the birth of a

queen, we find that this piping or humming was still more discernible to the auricular organ of Mr. Huber in the evening, and it then consisted of several monotonous notes, expressed in rapid succession like those of a trombone, although we may venture to opine not quite so sonorous.

Seven dreary days did the bees keep their future monarch imprisoned, and on the eighth, she piped most vociferously, when the bees no longer able to withstand the pressing entreaties of the incarcerated queen, uttered in such querulous, but melodious tones, proceeded on the ninth day to remove the barricade and open the cell, when *he saw* the young queen come forth, *lively, slender, and of a brown colour*. Now, however, the time was come, when Mr. Huber arrived at the solution of a great and momentous problem. He had previously candidly avowed his ignorance of the cause of the bees confining their queen, but the light of it on a sudden burst upon him, and all was at once *clear and manifest to him;* nevertheless, we shall find in the sequel that that, which was at that precise and fortunate moment so clear and manifest to him, was very soon afterwards discovered to be false and illusory.

According to the observations of Huber, the young queen had formed, it would appear, an erroneous judgment in regard to the complete development of her organic structure, for the common bees were far better informed on that important point, than she was herself, as, by virtue of some penetrating power, they had ascertained, that when her majesty first attempted to emerge from her cell, she was not in a proper condition to fly, whatever her own opinion might have been on the subject; and therefore the bees very wisely and politically determined to keep her majesty in a state of incarceration, until it *was clear and manifest* to them that she could fly. In what manner, or through what channel, Mr. Huber attained to the knowledge of these important points, is to us an insoluble mystery.

We must, however, now suppose, the young queen to have emerged from her cell in all her natural beauty and vigor, and Mr. Huber informs us, that she now engrossed the whole of his attention. Previously, however, to our entering into a detail of the extraordinary circumstances which Mr. Huber now witnessed, we will formally enter our protest against the power acknowledged and enjoyed by Mr. Huber of watching the motions of a queen bee with that accuracy and minuteness, which he has so circumstantially described. We have frequently been three hours in examining the bees of a hive, before we could obtain even a glimpse of the queen; and in the common straw hive, we declare it to be an actual impossibility, without driving all the bees out of the hive. The queen bee appears to entertain such an instinctive dread of being seen, that the moment the light is admitted into the hive, she conceals herself in the thickest cluster of the bees, and in the darkest part in which she can take refuge. The queen bees of Huber are however the most accommodating insects in the world, for in all his transactions with them, they appear in a certain degree to anticipate his wishes; their innate love of concealment appears for a time to be suspended, and they present to him on every occasion, the utmost possible facility of penetrating into the mysteries of their nature.

We will now proceed to the detail of the actions which Mr. Huber witnessed in the young queen; and, in the first place, immediately on her emerging from the cell, her murderous disposition began to manifest itself, and she repaired to the other royal cells for the purpose of murdering the embryo monarchs, but, here again, her majesty was thwarted in her regicidal intentions by the vigilance of her rebellious subjects. According to Huber it is a trait inherent in the nature of the queen bees to murder all the embryo queens; but fortunately for them, the bees possess a counteracting power; and in the present instance, the young queen had no

sooner sallied forth on her sanguinary intent, than the bees immediately enrolled themselves into a kind of national guard, and resolutely defended the royal cells from the fury of the youthful regicide. It will appear in the sequel, that, on account of a particular circumstance, these guards were obliged to be divided into twenty-seven detachments; and on the young queen presenting herself before one of the royal cells, resolute on the murder of its unfortunate tenant, she was immediately repulsed by the particular detachment appointed to guard it; nor did they treat her majesty with the respect becoming her rank, for they pulled her about, as if she were one of the lowest grade; they bit her, they tumbled her, they caught her first by one leg, then by another; they followed her about like a pack of bloodhounds: in fact, their anger and resentment had risen to the highest pitch; the whole hive was in a state of the most terrible commotion, nor was her majesty allowed to partake of any rest, until she had betaken herself off to the greatest possible distance from the royal cells, like an exile banished from his native land. Let us, however, attend to the sequel, and wild and wandering indeed must have been the head, and bold and presumptuous must have been the hand, which could dare to publish such absurd and palpable fictions as the result of ocular observation, and still more to send them forth, as of such a genuine and authenticated character, as to entitle them to be received into the Natural History of the Bee.

Consistently with the information of Mr. Huber, derived, be it understood, *from ocular observation*, the young queen was completely discomfited in her murderous intentions by the vigilance and activity of the guards; and during the remainder of the day, she sat sulking in a corner; and whilst the pouting mood was upon her, she placed herself in a certain attitude, the effect of which on the surrounding bees was indeed most miraculous. Huber indeed is not very specific respecting this important point of the attitude of the

queen; she might be standing on her head, or on her tail, or squatting like an American squaw on her haunches; but whatever the attitude might have been, the bees were deeply and sensibly affected by it. Their rage appeared in an instant to be appeased, and, to the inflated fancy of Mr. Huber, they looked like a crowd of mourners at a funeral, or a posse of schoolboys entrapped in an act of mischief; for so overcome were they with shame, that they hung down their heads!! and were stricken motionless!!!

And can all this be read without the smile of derision and contempt for the individual, who could promulgate such barefaced absurdities, such wild and evident impossibilities as the result of positively ocular observation? We fearlessly submit it to the decision of all impartial judges, whether it be not actually deplorable, that men like Kirby and Rennie, who publicly profess to be endowed with scientific knowledge, but who, as far as the Natural History of the Bee extends, appear to be actually destitute of the commonest power of discriminating between that which is false and that which is true—between that which is barely probable, and that which is directly impossible, should espouse a system so fraught with fallacy and fiction. We regard it as a direct insult to the human understanding, to suppose for a moment that the credulity of any person can be so great, or their judgment so hoodwinked, as to attach the slightest credence to such a fanfaronade, as that the queen bee is innately possessed of the power of emitting a particular sound, and of placing herself at will in such an attitude, as to make all the bees hang their heads, and to be rendered utterly motionless!!!

According to Huber, however, the foregoing scenes formed only the first act of the farce, for, on the subsequent day, the same rebellious spirit was visible throughout the hive; the murderous disposition of the young queen broke out again afresh, and consequently all the detachments of the

guards were called out, and duly posted for the protection of the royal cells, which now amounted to twenty-seven ! ! ! These guards, however, assumed all the pride and pomposity of their elevated station, and whenever the queen showed herself in the vicinity of a royal cell, they fell pell-mell upon her, and began to treat her in a most indecorous manner; whenever they testified an inclination, however, to be outrageously impudent, she assumed the dreaded attitude, which had a similar effect to the horn of Sir Huon, for the bees were instantly deprived of all further power of motion.

We will now proceed with Mr. Huber's description of a swarm, and the various adventures thereunto belonging. So precise and minute was Huber in his observations, that it was a few minutes after eight in the morning that the young queen left the cell; and it was exactly at half-past twelve, not a moment sooner nor later, that her majesty was seized with a kind of ague fit, shaking, and trembling, and shivering, and exhibiting the most alarming symptoms of the most violent internal agitation. The cause of this ague fit arose from the extraordinary circumstance, so accurately ascertained by Huber *from ocular observation*, that since the birth of her majesty, the royal cells had sprung up so multitudinously, that she could scarcely make her way to any part of the hive, without running the serious risk of knocking her head against one of them, and consequently exposing herself to the most insolent behaviour from the different detachments which were stationed for their defence. It amounts almost to a truism, that if a queen, no matter whether she be seated on the throne of England, or on a cell in a bee hive, adopt a particular fashion, no matter how absurd and preposterous that fashion may be, still her subjects will immediately adopt the same, and therefore it is by no means to be considered extraordinary, considering the case analogically, that because the

queen bee had the ague, that all the common bees should have the ague also; and in fact, according to the ocular observation of Mr. Huber, the shaking and shivering, the trembling and the agitation of the bees became so obstreperous, so outrageous, and so subversive of all regular order, that they were to be seen hurrying and skurrying about, and dancing and jigging, as if they had been bitten by a Tarantula. Not Pandemonium itself, when Satan convoked his rebellious spirits, could have presented a scene of greater hubbub and confusion, than this ill-fated hive now exhibited. The aguish fit increased with every moment, and the bees finding at last, that it was likely to be augmented past all endurance, simultaneously rushed out of the hive, and settled on a tree in the garden.

This, according to Huber, must be considered as the veritable rise and progress of a swarm, but the most amusing part of the history yet remains to be told; and rich as Huber has shown himself in singularities, in fiction, and invention, the following extraordinary occurrences may be classed as the alpha of them. In the majority of cases, which have come within the sphere of our experience, indeed we may add universally, the queen conducts the swarm; but in the present case, she is not permitted either to conduct it or to follow it. It is evident from Mr. Huber's statement, that the life of this young queen must by no means have been a very enviable one, which, however, did not proceed from any malice or revenge on the part of the bees, but from her own wayward and imprudent conduct, for what other queen but herself would have been so stupid and doltish as to attempt to pass between two royal cells before they had been abandoned by the guards? She must have been aware of the danger of such an act, and therefore her foolhardiness was inexcusable. Such, however, was the fate of this maltreated queen, according to the undoubted observation of Mr. Huber; for on passing between the

two royal cells, she was not only subject to every species of insolence from the guards, but they actually arrested her, and took her prisoner, and she was kept in durance vile, exposed to all the taunts and rebuffs of the vulgar and rebellious commonalty. And all this is the immediate effect of *ocular observation*, and deemed worthy to be circulated as veritable facts in the history of the bee, by a society professing to be established for the DIFFUSION OF USEFUL KNOWLEDGE!!

Whilst these proceedings were carried on in the hive, the bees of the swarm were quietly clustered in the garden, which, *en passant* be it mentioned, is not only at variance with all experience, but also with the fixed and natural habit of the bee, for no swarm will ever settle, unless it be accompanied by a queen, nor will a swarm even leave a hive, if a queen benot amongst them. The bees, according to Huber, waited a considerable time in the garden, in expectation of the arrival of the queen, little suspecting that she was suffering the degradation of imprisonment, at last, however, their patience became completely exhausted, and they returned very dejectedly to the hive.

It must however be observed that Mr. Huber, in treating of the ague or agitation of the bees, completely reverses the system which has been laid down by all preceding apiarians, and which is acquiesced in at the present day, namely, that it is the overpowering temperature of the hive, which is one of the inducements of the bees to swarm; but Mr. Huber, actuated, no doubt, by a spirit of originality, says, that it is the excessive agitation of the bees which increases the temperature of the hive, and that it is not the temperature, which, as in all other cases, occasions the agitation; thus adducing that as a cause, which is an effect, and that as an effect, which is in reality a cause.

The piping or humming of the young queens has been acknowledged by Huber to be a direct puzzler to him;

although, according to his usual consistency, he has given us *two* reasons for it: first, that it arose from her resentment in not being permitted to leave the cell, and, secondly, that her majesty wanted something to eat, which, of course, was duly and plentifully administered by the attendant guards, Mr. Huber being himself an eye-witness of the royal regale. On a sudden, however, a fresh light darts into his creative brain, and he discovers that neither of those two causes was the true one; but that it proceeds from a cause, which we are certain never could have been engendered in any other head than his own. He informs us of the exact circumstance which guided him to this important discovery, which was, that the bees, who form the guard of the royal cells, liberate the young queens *according to their respective ages;* but then Mr. Huber, with his accustomed sagacity, very properly inquires, by what means, or by what token or signs, are the bees to know exactly the age of the respective embryos? and also so very accurately, as never to make a mistake in the liberation of a young queen, for one that is more advanced in age? That the young queens must possess some particular power of imparting their real age to the bees is a point of which Mr. Huber entertains not the slightest doubt, and, therefore, what other power can that be, than that of piping or humming, and that the young queen, whose cell is first sealed is also the first to pipe, and so on in rotation with the whole; but then Mr. Huber very properly asks, how are the bees to remember which of the young queens piped the first, and thereby avoid the risk of committing the serious blunder of emancipating a junior for a senior? There is not, however, any obstacle which Mr. Huber cannot surmount, however strange and miraculous may be the means by which it is accomplished. A great difference, says Mr. Huber, exists between the voice of a young woman and an old woman, in which we perfectly agree with him; and therefore, argues Mr. Huber analogically, a great difference

must exist between the piping of a young queen and that of an old one; and this sapient conjecture becomes afterwards actually verified by his own experience: for he finds the older the queen, the deeper and hoarser is her voice. At two or three days old, it is a high treble; at five or six it is a soprano; at eight or nine it is a tenor; at ten or twelve it is a counter tenor; at fourteen or sixteen it is a barytone, and when arrived at full maturity, it is a full deep bass: but let it not be considered that this is mere conjecture on the part of Huber; for he unequivocally states that he has himself been able to distinguish a difference in the sounds, not only in relation to the quick succession of the notes, but also to their acuteness and intensity; and he very significantly argues, that as the difference in the sound is perceptible to himself, why may it not be so in a greater degree to the bees? We certainly see no reason to the contrary, for if they understand the old queen when she speaks the French language, they certainly ought to understand her better when she speaks in her native tongue, and to distinguish to a nicety whether her notes be uttered in a soprano or a barytone. In regard, however, to this articulating faculty of the young queen, one of the most surprising circumstances attending it is, that it is only in a state of captivity that the exercise of it is permitted; but when once set at liberty, most wonderful to tell, the organ of sound is by some means destroyed, and the piping is heard no more. We have read of a certain Martinus Flaccus, who had a sloebush growing out of his breast, and as long as the sloebush flourished, Flaccus could speak the Dutch language; the sloebush died, and Flaccus could speak the Dutch language no more. This miracle is, however, not more astounding, than that the queen bee should be able to pipe if cooped up in a cell, but that when set at liberty, she cannot pipe at all.

We have had frequent opportunities of eulogising Mr.

Huber for the consistency of his observations; and we have now an additional proof to adduce of how richly he is deserving of that eulogium, for in one place we find him promulgating the fact, that when the young queen emerges from the cell, she loses the power of emitting any sound whatever; but if we proceed a little further, we find, to our great surprise, that the old queens possess the power, when at liberty, of emitting the piping sound. On which of these two statements are we to bestow our credence? The case of the old queen emitting this sound is thus described by Huber, page 193. "Mr. Huber was very anxious to observe the motions of the old queen; he *saw* her mount a royal cell, as if she were ascending a throne, and having seated herself comfortably upon it, she began to symphonise, at the conclusion of which, she assumed the dreaded attitude, and the bees of course were stricken motionless." It appeared however on this occasion that the articulating power of her majesty must have been soon exhausted; for on a sudden the sound ceased—the bees became immediately endowed with motion—they resumed their wonted courage, and with a most rebellious spirit drove her from the throne on which she had seated herself.

The reasons for the confinement of the young queens in their cells by the bees have also been the source of anxious inquiry by Mr. Huber, and he has favoured us with many various statements for those reasons; indeed his ingenuity on this head appears to be rather inexhaustible, for he on a sudden discovers that the bees are excellent judges of the weather, which, by the by, is a discovery made long before Mr. Huber appeared in the world. It was, however, in the first place discovered by that renowned naturalist, that the incarceration of the young queens arose from the bees having ascertained that she was not in a condition to fly, but he subsequently discovers that this apparently tyrannical and ungracious conduct on the part of the bees did not proceed

from any malicious or vindictive disposition; but that a reconnoitring party had been despatched to ascertain the state of the weather, and finding it not exactly suitable for her majesty to make her first appearance before the broad face of heaven, they, with a very affectionate consideration for her safety, determined to keep her a prisoner until the weather should become so genial as to admit of her majesty leaving the hive, without the risk of damaging her beautiful person. Now, it must be observed, that this is a discovery, for which Mr. Huber takes great credit to himself, for he says, that as the bad weather *might* continue for several days, during which the young queens *might* have arrived at maturity, and all of them have left their cells, the consequence would be that duels and combats would be raging night and day, and of course no swarms would be produced, as only the victorious queen would be remaining in the hive; therefore, he continues, it is a wise disposition of nature to ordain, that the bees shall keep the young queens prisoners, until the weather and *other circumstances* admit of the swarm leaving the hive.

To follow Mr. Huber through his history of the birth of his six queens would be to fill our pages with a series of the wildest extravagancies and the most absurd fictions, which ever polluted a work, professing to be the history of a living creature. To those, however, who wish to experience to what extent the vagrant fancy of an individual can carry him, we refer them to page 193, et seq. of Huber's work, or to the transcript of his absurdities in the pages of the Insect Architecture, the History of the Hive Bee, published by the Society for the Diffusion of Useful Knowledge, and the Naturalist's Library.

The departure of a swarm is one of the most gratifying sights to an apiarian, and it well repays him for many hours of anxious watching. The whole hive appears in a state of the greatest commotion; the bees seem as if some powerful

enemy had taken possession of their hive, and were expelling them from it by force. The whole community appear in a state of emotion, and thousands are seen circling the air in all directions. The first bees which leave the hive are seen to return, hover an instant before the hive, and rise into the air. The whole swarm then leave the hive attended by the queen, and repair either to some previously selected spot, or alight on the branch of an adjacent tree or bush.

It has long been a matter of speculation with apiarians, whether the bees send out, what may be called their advanced guard, to select a proper place for the establishment of their new colony. As far as our opinion may be valid, we have not the slightest doubt of the fact, for it has frequently come under our observation. We once possessed a small apiary at a gentleman's house in Perthshire, and the time of swarming of one of the hives was regularly known by a small cluster of bees appearing in one of the chimneys, which we were always obliged to cover with a sack to prevent the bees from entering.

Mr. Knight, in a letter addressed to Sir Joseph Banks, and which is inserted in the Philosophical Transactions for 1807, has verified this fact. It is not, however, of recent discovery; for numerous writers have mentioned it, especially St. Jean de Crevecœur, in his letters *du Cultivateur Americain*, the first of which is of 1770, and at the sixty-second page of the first volume, he thus expresses himself: "One of the problems most difficult to solve, is to know when the bees will swarm, and whether the swarm will remain in the hive provided for them, or escape to establish themselves in the cavity of some tree; *for when by the means of their emissaries, they have chosen for themselves a retreat, it is not possible to retain them in any hive which may be selected for them.* I have several times forced swarms to enter into hives which I had prepared for them, but I always lost them towards

the night; at the very moment when I the least expected it, they flew away in a body to the woods."

We dissent from one part of these remarks of St. Jean de Crevecœur, as in numerous instances we have retained a swarm in a hive, which we were fully aware had sent forth its advanced guard for several days previously. There may be other causes operating on the bees to induce them to leave the hive prepared for them, such as there being two queens, or perhaps no queen at all; and it is certain that the bees will take a particular dislike to a certain hive, in which no skill nor force can retain them. It is also consistent with experience, that bees kept in an apiary in the vicinity of woods, when they send forth their swarms, have always a propensity to lodge themselves in a tree which is in their vicinity, because it is their natural and primitive habitation.

Duchet, in his work on bees, printed at Vivay in 1771, says, page 25, "I have seen more than once that swarms, *before leaving the hive*, have sent forth their foragers to provide a dwelling in the cavity of a tree, about a quarter of a mile distant, and the swarm repaired to it *by the nearest road*, and with a celerity which would have defied the fleetest horse."

Mr. Ducarne says, "*that he has seen this advanced guard sent forth before the swarm;*" we can only reply to Mr. Ducarne, that although we may be positively convinced of the fact, yet we will venture to assert that the actual verification of its departure never yet took place.

Dubost, in his work on bees, says, page 69, "Let it not be supposed that a swarm departs on mere hazard; it would be forming an erroneous opinion of those insects, which, to the eye of the observer, present so many proofs of intelligence. This assertion is not mere conjecture; it is founded on facts, of which I have been an eye witness; and the following is the most striking. I was walking one

morning about nine o'clock before my apiary, examining the motions of the bees, when I perceived some bees enter and depart from a hive, which I knew was empty, and which had never been made use of. Anxious to know the purport of their visit, I inspected the interior, and found about a hundred bees, who ran about the hive, apparently in great confusion. I was struck with thi ssingularity, without being able to attach any particular cause to it. During dinner, I was informed that a swarm was seen on the wing, which was believed to come from one of my hives. Although I was certain that it did not belong to me, I could not resist the pleasure of observing its flight. I had no sooner arrived in my garden, than I saw it direct its flight to my apiary. Recollecting the observation which I made in the morning, I conjectured that they were going to take possession of the empty hive. The case was really so; and two other apiarians afterwards informed me, that the same occurrence had taken place amongst their hives *."

We have known many keepers of bees lose their swarms from a culpable negligence in providing themselves with new hives. This neglect is unpardonable, and can only result from a most niggardly disposition, or from direct obstinacy. The cottager, after having suffocated his bees, and extracted all the combs from the hive, throws the latter aside, perhaps in some damp place, intending to place a swarm in it in the following season ; during the winter, the hive has been the harbour of the most noxious vermin, and perhaps without even the trouble of cleaning it, the cottager puts his swarm into it; when, if the bees do not leave it from disgust, they are gradually destroyed by the ravages of the vermin. Circumstances may, indeed, sometimes combine to thwart the precaution of even the most provident apiarian.

* There is an old obsolete law in our statute book, which prohibits a person, under a certain penalty, from placing an empty hive in his garden. This law was no doubt founded on the probability of the swarms of other persons taking possession of the empty hive, and thus the rightful owner was deprived of his property.

A swarm may be thrown off at a most unexpected period; in which case, there are several vessels and utensils, which may be used in the interim, until a proper hive can be obtained. A pail, a box, or even a large flower pot will enable the proprietor to retain the swarm. We once knew an old woman, who not having any other utensil at hand, took one from under her bed; but as it happened to be glazed inside, the bees could not obtain a footing in it, and they forsook their unique habitation in search of a better.

If the bee master has selected new hives for his swarms, his first care should be to divest the interior of all projecting straws, which will save the bees considerable trouble. The most easy method is to singe them, and then rub them violently with a hard brush, by which means, the interior of the hive will become quite smooth, and fit for the operations of the bees.

It seldom happens that the first flight of a swarm is to any great distance, for they generally alight on a neighbouring bush. Every exertion should then be immediately made to hive them, for they generally take to their wing again in two or three hours, especially if the sun shines upon them with violence; and even when they are hived, they should be covered with a sheet, or table-cloth to protect them from the heat.

No specific rules can be laid down for the manner in which a swarm is to be hived, as it depends on the particular situation in which it has fixed itself; if on a bush or the branch of a tree, all that is required is, to put the hive under it, and with a bough, or the wing of a goose, brush the bees into it. Some persons place the hive over the swarm, and then by teasing and provoking the bees, induce them to ascend into it; but this system is faulty and tedious, for the bees will never ascend until the queen bee sets the example, and it is very seldom that she can be caught in the swarm, as she generally conceals herself in the middle.

By the cottagers, various plans are adopted for the pur-

pose of inducing the swarm to settle, such as beating frying-pans, pokers, and shovels, and throwing amongst them water and sand. Martin recommends the use of the garden engine; but the question here arises, whether an instrument of that unwieldy nature can be brought at all into action. We are, however, by no means an advocate for any of these experiments; the better method is to watch the swarm in silence, and when they have once collected themselves, to lose no time in hiving it. Many persons perform this operation without any safeguard to their person: we would, however, always recommend some covering being applied to the face, the hands, and the legs, for the very consciousness of security imparts a greater degree of boldness and presence of mind, and these are two qualities, which are indispensable in all operations connected with the apiary.

Wildman and numerous other apiarians strongly recommend the fryingpan and the tongs and poker system; but in our long experience, we never observed the bees pay any attention to the din and uproar; for were it to equal the noise at the building of the tower of Babel, the bees will not settle, until the queen has set them the example. We are inclined to believe that the custom of beating warming-pans and shovels and pokers did not originate in any notion that the swarm would be induced to settle the sooner, but that it may be traced to an intention on the part of the proprietor to apprize his neighbours of the departure of his swarm, that he may be able to claim it as his property. It is a very false idea entertained by some of the country people, that if a swarm settles in their garden, it becomes their undisputed property. By the same law of reasoning, they might claim a pig or a cow that had intruded itself upon their premises. The chief difficulty in regard to the swarm is the identity of it, for the cottager argues that it is very probable other hives in the neighbourhood may have swarmed; and where a person is inclined to be dishonest, he is very seldom at a

loss for arguments to support him. The law however sanctions an individual in entering the garden of another person, to obtain his swarm, provided he can prove that he never lost sight of it from the time of its departure from the hive, till the moment of its settling; he is however obliged to remunerate the proprietor of the garden for any damage he may commit in the hiving of the swarm.

The country people are very capricious in the liquids and substances which they make use of for rubbing the interior of the hive to invite the bees to ascend into it; all of which are of little or no efficacy, if the queen bee takes a dislike to her new habitation. Honey, odoriferous herbs, and even the juice of bean stalks have been recommended; and should the bees ascend into the hive on the application of any of these articles, it is immediately ascribed to their specific virtue, and not to the will or caprice of the bees. There is one liquid, however, the efficacy of which we have frequently tried with success, although it was not clear to us that the bees would not have settled in the hive equally well without it. This liquid is human urine, and we are disposed to admit that we never applied it to a hive, in which the swarm did not immediately settle. It is rather a singular but a frequently verified fact, that a swarm almost universally rejects a very large hive, and they will never settle in one, that is musty or which has a bad smell *.

When the swarm is hived, and the bees appear restless and confused, it is a certain sign, that the queen is not

* In Italy and France they rub the hives with the leaves of garlick and onions, and Contardi, who was well instructed in the natural economy of bees, goes so far as to assert that the bees accustom themselves to this odour from the want of a better. If however we compare this statement with that of the Abbé della Rocca, and take into our consideration at the same time the experience of apiarians in general, some surprise at the hardy assertion of Contardi must necessarily be excited. "It is certain," says L'Abbé della Rocca, "that we should particularly refrain from approaching our bees, when we have been touching either garlick or onions, or even when we have been eating cheese, as we are then sure of being attacked with great acrimony."

amongst them, and the bees will then soon return to the parent hive. The most prudent method to be adopted in this case is to examine the parent hive, and as at the swarming season there are in general a number of queens in a hive, to obtain possession of one of them, and unite her to the swarm. They will receive her with every demonstration of joy, which will be perceptible by the motion of their wings, occasioning a loud humming noise.

It sometimes happens that a swarm divides itself into several clusters, which is a certain sign that there are several queens, each cluster perhaps having one. It is recommended by some apiarians to leave them in this state, as the lesser cluster will attach itself to the larger, and the queens, finding themselves forsaken, will also join the general group; this, however, at the best is a bad practice, independently of its being a useless waste of time. The bees in forming a spontaneous junction evidently point out the method which ought to be adopted, and therefore the clusters ought to be united with all possible despatch, and every means should be employed to take captive the superfluous queens, and, on finding that the bees agree after their junction, to destroy the queens without any further ceremony. Lombard and Ducouedic recommend that it should be left to the judgment of the bees to kill whatever queens they please, as they are supposed to be the best judges in matters of that kind: we dissent however from their recommendation, on the ground, that no harmony nor concert of action can exist amongst the community, whilst there is a superfluity of queens amongst them; that they will be apt to separate, and be led away by the respective queens, and thus prove a dead loss to the proprietor.

It frequently happens in an extensive apiary that swarms from different hives will form a junction, in spite of every endeavour to prevent it, and it is doubtless this circumstance, which has given rise to the account of those enormous

swarms, which is to be found in the works of the foreign apiarians, particularly the French, who speak of swarms weighing twenty or thirty pounds each, containing about forty or fifty thousand bees. In the case of the junction of second swarms, this circumstance would not be prejudicial to the proprietor; for on their being hived, the bees would kill the superfluous queens, and one good stock would then be formed, which is at any time better than three weak ones. Supposing them, however, to be first swarms, it is the interest of the proprietor to keep them separate, and their junction becomes therefore a calamity. It has however, its remedy, and the following is the process to be pursued.

The swarm being collected into one hive, a sheet must be spread on the ground; the hive must be held over it, and on giving it a smart knock at the top, the bees will all fall upon it; no fear need be entertained of their flying away, and the search must be immediately instituted for the queens. Their immediate presence may be ascertained by small groups being collected round them. Having attained to the certainty of a queen being in the midst of a group, cover them with a small bell glass or tumbler, and then proceed to divide the bees as nearly as possible into two equal proportions. For this purpose, two hives must be in readiness, and a queen must be put into each; continue to portion out the bees to each queen, until the entire division has been effected: then take the two hives, and place them at the greatest possible distance from each other. A little confusion may at first occur; but if a certainty exists that there is a queen bee in the hive, perfect tranquillity and peace will be found restored on the following morning. No further fear then remains of a re-union.

Supposing the swarm to be hived in the morning, which is the general time of swarming, the hive however must not be moved until late in the evening, in order that sufficient time may be given for the stragglers to regain the hive. We

have always observed that for two or three days subsequently to the swarming, several bees are to be seen hovering near the spot on which the swarm first alighted. We have even seen them cluster, but at night, they invariably disappeared.

The most certain method of discovering the value of a swarm is by its weight, although it is still asserted by many that the size is a true criterion. The latter opinion is, however, erroneous, for the size of a swarm depends in a great measure on the temperature of the air ; if it be very hot, the bees will extend themselves in order to admit a greater influx of air between them, whilst, on the other hand, if it be cold, they will crowd together to increase the heat by reciprocal action. The weight is therefore the best criterion; and this can be effected by first weighing the hive when empty, and then again immediately after the swarm has been put into it. A weak swarm weighs from one to two pounds, the middling ones from three to four pounds ; the good ones about five pounds, and the excellent ones from six to eight. Reaumur speaks of swarms of twelve and fourteen pounds ; Chaptal estimates a good swarm at ten pounds, Feburier at eleven, Dezilles at ten, Lombard at fifteen, and Ducouedic at fourteen ; whilst amongst the English apiarians, Bonner calculates a good swarm to weigh six pounds, Wildman estimates it at eight, Keys at seven, Espinasse at five, and Thorley at six. Thus the mean weight of the French swarms is eleven, whilst that of the English is only six. We cannot account for this difference in any other manner than the superiority of the climate, for the French hives are not more capacious than the English, nor does the size of a swarm depend in any degree on the space in which the bees breed, as can be proved by those swarms which issue from the trunks of trees, or the roofs of houses, where the space in which they work is unlimited.

In regard to the second swarms or *casts*, the difficulty of ascertaining the precise time of their departure is very great,

as none of those preparatory signs are displayed, which mark the rising of the first. We will, however, give those *secondary* signs by which some tolerably accurate notion may be formed of the departure of a second swarm. It may generally be looked for from the 4th to the 8th day after the first swarm ; some hives however never throw a second swarm at all, and this may in some degree be ascertained by inspecting the hive immediately after the first swarm has departed. If the combs be bare and destitute of brood, if the supernumerary princesses be seen dead before the hive, if the bees tear from the cells the nymphs of the drones, no second swarm is to be expected.

Independently of the dead queens which are thrown out of the hive, it must also be examined if the bees tear the royal nymphs from the cells ; the massacre of the queens is then a certain sign, that there will not be a second swarm; but if the bees be satisfied with killing only some queens, without destroying the nymphs at the same time, the chances of a second swarm then are great, and for the following reason. It often occurs, that previously to the departure of the first swarm, there are three or four queens in a hive, or in an embryo state, and from an innate sense of independence, each is ready to place herself at the head of the new colony. Of these three or four queens, but one, and seldom two, depart with the first swarm, and the others remain in the hive, probably to place themselves at the head of the second swarm. The bees, however, seeing that the population is not sufficient to support a second emigration, before the brood could furnish fresh recruits, sometimes kill all the supernumerary queens which are hatched, especially if they have exhibited any proof of rebellion against the mother queen, for it has sometimes happened that the young queens, full of ambition, have succeeded in dethroning and usurping her place. Thus, whilst the population of the second swarm is completing, other queens are born, who depart with them.

For this reason, the massacre of the queens ought to be accompanied with the expulsion of the royal nymphs, in order to form the just conclusion that the hive will not throw a second swarm.

We may venture to affirm in contradiction to Huber that the queens take no part in the massacre of their superfluous royal progeny, although Huber has so frequently witnessed it; and he presents us with the following ludicrous description of the royal duels, which take place in the hive, on a young queen emerging from her cell. In his account of the birth of the six queens, he says, on the occasion of the birth of the fourth queen, she showed no immediate disposition to leave the hive; on the contrary, it appeared to be her opinion, that as there were once two kings on the throne at Brentford, there might for once be two queen bees reigning in the same hive*. The reigning queen was of a different opinion, and therefore the only way of settling the dispute was by a duel, and a duel did accordingly take place. It appears however, according to Huber, from his ocular observation,

* As a proof of the correctness of the knowledge of Kirby and Spence of the interior economy of a hive, we read in their "Introduction to Entomology" of two queens co-existing in the same hive, one being larger and the other smaller, and they proceed in utter defiance of all experience to disseminate the error, that the latter is bred in a cell as large as that of the common queen's, and is endowed with an ovary, in which, however, no egg was ever yet discovered. This untenable error is, however, not inserted in their work as the result of their own experience, but on the authority of Needham and Huber. It should, however, be remarked, that men professing to impart instruction to others on any subject of which they are themselves practically ignorant, should be particularly cautious in regard to the authorities which they may select, as, otherwise, that which is intended to be instructive, becomes the very reverse. On referring to the works of Needham, we find, page 82, "In no instance was it ever known that there were more than one queen in a hive, with the exception of the breeding season, when there may be several young queens, but they depart with the swarms or are killed by the bees." Huber denies the existence of two reigning queens in a hive, and Kirby himself admits, that he never saw any of these little queens; and yet in despite of his own experience, and contrary to the two authorities which he has named, he circulates the fact of their existence. Reaumur says, that some queens are larger than others, and he attributes the difference in their size to the number of eggs in their ovaria.

that the night is the time selected by the queens for their duels, and we make not the slightest doubt that, in regard to accuracy and authenticity, the nocturnal observations of Mr. Huber are as valuable as his diurnal ones.

In regard, however, to these duels, Huber evidently saw that he had plunged himself into a dilemma, from which it was difficult to extricate himself; for he saw that by bringing the queen bees into personal conflict with each other, a great probability existed of both the queens dying at the same time; and therefore, although he endows them with a pugnacious spirit, he also makes it appear that they have an instinctive dread of each other; for he says, they no sooner found themselves belly to belly, and their extremities or tails about to meet, which is the precursor of the infliction of the sting, than nature instantly prompted them to disentangle themselves, and to run away from each other like the veriest cowards. This, in the language of the pugilists, would be called a round; for having had, according to Huber, a sharp set-to, they retire to be cleaned and refreshed by the *drones;* but as the drones possess not the power of degurgitation natural to the common bee, we are left in the dark as to the kind of refreshment which the drones have in their power to administer to the fighting queens. Huber, however, proceeds to state, that the queens having been properly refreshed, returned to the combat several times during the night, all of which was *pretty perceptible* to Mr. Huber, but by what means it really became perceptible to him, he is silent; still, however, the death-blow had not yet been struck. The thirteenth night was, however, the fatal one. One of the queens, determined upon mischief, went boldly in and succeeded in thrusting her sting into the body of her antagonist. The vanquished queen immediately gave up the ghost; the drones of the triumphant party set up a shout of victory, which Mr Huber gravely and veritably informs us bore a strong resemblance

to the booming of a bassoon, intermingled, at times, with the harmonious shrillness of the Scotch bagpipe.

There is, however, a most extraordinary circumstance still to be related, touching the conduct of the victorious queen. It was most natural for her to expect, that after her splendid victory, she was to be immediately installed into all the rights, privileges, and immunities of royalty, but in this expectation her majesty was most egregiously disappointed, for the common bees treated her with the most marked indignity. She was literally sent to Coventry, for not one of her subjects would hold any intercourse with her. If she presumed to insert her proboscis into a cell for the purpose of partaking of a little refreshment, she was most unceremoniously jostled by the bees, and driven away. In fact, she was subject to all the taunts and rudeness of the canaille of the hive; if, says Mr. Huber, she seemed disposed to take a nap, the bees immediately pounced upon her and roused her from her slumbers. This singular conduct completely staggered the conceptive powers of Mr. Huber; he had never *witnessed* such a scene before, and, therefore, the whole was to him an insoluble problem. It did not, however, long remain so, for he discovered that the bees were not like the English people in the reign of Queen Elizabeth; they were determined not to be governed by a *virgin queen*. This determination of the bees was, by some means unknown to Mr. Huber, conveyed to her majesty, and she resolved not to lose any time in removing the cause of complaint, which her subjects had raised against her. She, therefore, went forth on a vagabondizing expedition into the regions of the air, and in a very short time returned, to the great delight of Mr. Huber, and the entire satisfaction of her subjects, with all the external signs of fecundation, that is, with the genital organ of the drone attached to her. Huber seems to imply that a kind of committee was appointed to ascertain the verity of that fact, which being confirmed and reported

in due form to the community at large, her majesty was received with all becoming homage and veneration. She was invigorated by a dose of royal jelly, and formally installed into all the dignities of her station ! !

These reveries and fancies of "the prince of apiarians" may be amusing; but to those who seek for instruction, they are worse than useless, for they mislead the uninitiated into a field of romance and fiction, in which they may delight to roam, impelled by a love of novelty and originality, but from which they eventually return, their minds surcharged with prejudice and error, and rendered almost impervious to the light of truth. The same remark which Huber makes, when speaking of the discoveries of Schirach and Riem, namely, that he cannot comprehend by what means they were able to make their observations, may with the strictest propriety be applied to himself; for it must be evident to every one, who possesses the slightest knowledge of the interior construction of a hive, that Huber has asserted, as having often witnessed many things, which it is actually physically impossible that he ever could see. We defy Kirby and Spence, we defy Mr. Rennie, and we defy the whole host of Huberians, to prove to us satisfactorily even the possibility of witnessing the pretended discoveries of Huber. The very make, position, and construction of the combs, present an insuperable obstacle to a successful research; and although some little insight may be gained of the interior economy of the hive by means of the mirror hive, yet even with that advantage, on account of the uniform aversion which the bees always manifest from continuing their labours on the admission of light, and more especially in every case in which the motions of the queen bee are concerned, it amounts almost to a direct impossibility to penetrate into the mysteries of their economy: and it may with the greatest confidence be asserted, that there is not perhaps any object in animal nature, which has hitherto

baffled, and still continues to baffle the research of man in a greater degree, than the honey bee. It is not, however, simply the impossibility of Huber to have made his alleged discoveries, that we mean to maintain; but we contend against the actual truth of them, and in no instance with greater force, than in the massacre of the young queens by the first queen that happens to emerge from her cell. This very circumstance, however, carries with it its own refutation; for were it a general and established practice, as a part of the nature of the young queen bee, to kill the others in the cells, the question then naturally arises, in what manner are the different swarms to be provided with their queens, without which no swarm will leave the hive? Huber may indeed step in and say that he has provided against this casualty by the establishment of his guards; but where is the individual, who can be so credulous as to believe that a number of bees are regularly posted as guards to prevent an act taking place, which is in itself a direct infraction of the universal order established by nature, at the same time that it is at variance with the fixed and invariable action of the bee?

There is, however, a most remarkable circumstance mentioned by Huber in regard to the first transformed queen killing the nymphs of the young queens, which cannot but prove highly entertaining to those, who are acquainted with the manner in which the nymph of the young queen lies in the cell. It is well known that the nymphs of the common bees lie invariably with their head towards the orifice of the cell; for were they placed in a contrary direction, that is, with the tail to the orifice, the order of their nature would be reversed, and they would not be able to extricate themselves from the cell. It is by their forceps or mouth that they gnaw away the film, with which the bees have covered the orifice of the cell, and thereby obtain their liberty. It is similarly constituted with the young queen; with this

difference, however, that she is always bred in a vertical position, but the head is universally directed towards the orifice.

The killing of the young queens, by the first virago who emerges from her cell, is one of the favourite crotchets of Huber, and, therefore, it is very proper that he should account for the manner in which the work of murder is perpetrated, although the dimensions of the cell in which the queen is bred render the act, as described by Huber, an actual impossibility. In order to confirm the truth of our remark, it is simply necessary to establish the dimensions of the queen's cell, and it will be found on an average to be three quarters of an inch long, and this admeasurement must be kept strictly in mind in the investigation of the following facts, as decided by Huber to display themselves in the massacre of the young queens.

Huber discovers in the first place, that the working bees and drones fabricate complete cocoons, which are close at both ends, and surround the whole body of the insect. This is, however, a discovery which was made long before the time of Huber, and is accepted as true in the natural history of the bee. His discovery, however, respecting the cocoon of the queen bee is decidedly original, and in perfect keeping with his habitual acuteness and accuracy. It happens, however, to be as erroneous, as it is original, which can be proved at any time by the inspection of a royal larva. Huber says the royal larvæ do not spin perfect cocoons, they being open at the abdominal extremity, enveloping only the head, thorax, and first ring of the abdomen; and the cause of this opening or imperfect cocoon is as follows, the discovery of which gave infinite delight to Mr. Huber, as it furnished him with another opportunity of imposing on the credulity of his readers.

According to Huber, it is the first queen, who emerges from the cells, that stings the nymphs of the young queens

to death; but this, he says, could not be accomplished, were the royal cocoon, like that of the common bee, perfect; and the reason given for this is, that the silk of the cocoon is of so close a texture, which, by the by, is a direct falsity, that the sting could not penetrate, or if it did, *the sting on account of its barbs would be retained by the meshes*, and the *queen, being unable to extract it, would become the victim to her own fury*.

In all matters connected with natural history, in which consistency ought to be the leading characteristic, we are naturally led to dispute the intelligence and the authenticity of that individual, who, although apparently the inventor and founder of a system, is continually contradicting himself in the very principles of his own system, and who appears to be led and misled rather by the conceit and fancy of the moment, and the unconquerable desire to promulgate a novelty, than by the result of actual experience *. In

* We have certainly good grounds for censuring the committee who publicly profess to superintend the publications of the Society for the Diffusion of Useful Knowledge, in having selected an individual as the editor of one department of their works, who has publicly declared himself incompetent to the task, on the ground of a total absence of all practical knowledge of the subject on which he professes to treat. We allude to Mr Rennie, who is the avowed editor of the Hive Bee and the Insect Architecture, published under the auspices of the Society for the Diffusion of Useful Knowledge. In the true spirit of dogmatism, Mr. Rennie declares all those statements and discoveries to be false and undeserving of the slightest notice, which are in any degree refutatory of the theory or system of Huber; whilst, at the same time, he unblushingly confesses, that he has no experience of his own to warrant him in the conclusions which he has drawn, but having the authority of Huber to support him, he considers it all-sufficient, not only for himself, but for those who are desirous of acquiring any decisive knowledge on the subject. In the review of the Insect Architecture, published in that excellent work, the Magazine of Natural History, conducted by Mr. Loudon, the reverend reviewer expresses his opinion, that Mr. Rennie has not only been led, but also that he has been misled by Huber, to which Mr. Rennie indignantly replies, that neither the one nor the other is the case; yet nearly in the same breath, he confesses, that he has no practical experience of his own on the subject on which his editorial ability has been exercised; and consequently this candid confession amounts to a direct avowal that he must have been led by the experience of others, and having no criterion by which to judge whether that experience be true or false, he very properly exposed himself to

corroboration of the truth of the foregoing remark, we have only to compare the statement of Huber in regard to the stinging of the queen bee when she has to sting one of her own kind, and when she has to sting any other object. In the former case, she can extract her sting with the greatest facility, in fact, there is not the slightest risk attending the infliction of it; but then we are subsequently told, that if the queen attempts to sting the cocoon, the silken covering of which is of a gossamer texture, the sting on account of the barbs would be retained, and the death of the queen be the consequence. Thus, according to Huber, there is no risk of the queen stinging through the abdominal rings of the embryo queen, which are of a hard, horny, and almost impenetrable nature; but that there is a positive risk in her stinging through the slight, flimsy silken covering of the cocoon Consistently, however, with the system of Mr. Huber, it is actually necessary, in order that the young queen may destroy her rivals, that the last rings of the body shall remain uncovered, and, therefore, it is ordained that the royal nymphs shall form only imperfect cocoons. It must, however, be particularly observed, as another proof of the consistency and verity of Mr. Huber, that the last rings alone should be exposed; for the sting cannot penetrate any other part, the head and thorax being protected by shelly plates, which it cannot pierce. And let us now inquire how are the abdominal parts of the bee protected? by five hard shelly plates or laminæ, overlapping each other, and which are as proof against the sting, as any other part of the body. Mr. Huber, however, now plays the

the charge, of having been both led and misled by the authorities which he has quoted, and it is certainly impossible for any one, in the least conversant with the Natural History of the Bee, on perusing the account of the Hive Bee in the Insect Architecture, not to arrive at the same conclusion with the reverend reviewer, that Mr. Rennie has allowed himself not only to be servilely led by Huber, but also that he has been *misled* by Miss Jurine.

egotist, and declares that this observation of his is both very new and very singular. We dispute neither of the positions; it is indeed both new and singular, but, at the same time, it is both false and absurd. It is, in fact, an actual impossibility that the case can occur as Huber has represented it; notwithstanding his servant informed him, that he had completed the necessary experiments in confirmation of it. It will, however, be seen in the sequel, that both master and man discovered that what they had seen was not, nor could be true, and rather than acknowledge themselves in an error, they invented a system still more preposterous and absurd than that which they had discarded.

In regard, however, to the stinging of the royal nymphs, it must be remembered, in the first place, that the royal cells are of an acorn shape, wide at the base, bulging out in the centre, and diminishing gradually towards the orifice. The nymph of the young queen in its cocoon entirely fills the cell, with its tail towards the base. Allowing then Mr. Huber all the benefit of his imperfect cocoon, we will suppose one of these nymphs to be the destined victim of an infuriated queen just emerged from her cell, and whose death is to be accomplished by her sting. Huber admits that the head and thorax of the nymph are proof against the sting, and therefore it is only in the last rings of her body that the attack can be made. Now the question naturally presents itself in the first place, what is the extreme length of the queen's sting? It is not the eighth part of an inch, and therefore it is an actual impossibility, that the queen can make any attack in the quarter as described by Huber, unless she be endowed with the power of projecting her sting to any length she pleases; which in this case must extend to nearly three fourths of an inch, being almost the whole length of her body. Huber will not be so bold as to assert that it is possible for the queen to insert any part of her body into the cell of the nymphal queen, who is to

be stung to death; and, supposing that the sting were so inserted, it could not be done in any other manner, than in a straight line, and how then could it be thrust into the last rings of the body of the nymph?

Huber has laid it down as an invariable principle that the bees kill the queen by means of their sting; yet we find that in the case of a stranger queen attempting to enter a hive, they have another and more curious way of despatching her majesty, which must be excessively tedious and annoying to the regicides. The exhibition of the spectacle must have been highly amusing to Huber, for he says, "that on the strange queen attempting to force her entrance into the hive, the guards (!!!) hemmed her in so straitly within a clustered circle, turning their heads on all sides towards her, that it was actually impossible for her to penetrate into the interior. If they retain her a prisoner too long, she dies either from want of food, or air, but *never from the sting.*" Such are the precise words of Huber, and yet, in other parts of his works, he establishes it as an undisputed point, according to his own opinion, that the queens kill each other by their stings, and in regular pitched duels.

We, however, perfectly coincide with the opinion of Mr. Dunbar, that no duel nor combat takes place amongst the British queens, whatever may be the case amongst the Genevese; the queen bee is by no means of a quarrelsome nor yet of a fighting disposition; for were the queens, as Huber represents them, to be so excessively prone to enter into personal conflict with each other, the chances would be, that both might fall in the contest, and then farewell to the health and prosperity of the hive. Indeed, the fall of both queens is a circumstance by no means uncommon; for it has frequently occurred, in the junction of two second swarms, when we have been unable to catch either of the queens, and the death of one of them has consequently been left to be executed by the bees themselves. This is easily accounted

for under the following circumstances. The bees of the respective swarms, each striving for the ascendancy, attack the queen which does not belong to them. The bees of the swarm A attacking the queen of the swarm B, and the bees of the swarm B attacking the queen of the swarm A; thus perhaps both the queens fall at the same moment, and for this reason, we strongly recommend that the queen of one of the swarms should, if possible, be caught before the junction takes place; but, at the same time, the captive queen should not be immediately killed, nor until the result of the junction has been satisfactorily ascertained.

In all the experiments by which we have tried to discover the reciprocal sentiments of one queen bee towards a stranger queen, supposing both of them to be in the same hive, we never met with a single instance in which they did not shun each other; and, rather than enter into single combat, most anxiously betake themselves to the utmost possible distance from each other. In fact, there is no living insect, which appears to be more sensible of its value and importance to the community over which she presides, than the queen bee; and we have invariably experienced, that rather than risk a personal encounter *à la Huber*, she very wisely retires to a place of safety, and leaves the task to her faithful subjects, of emancipating her from the presence of a hated rival, and thereby remove all the danger, which an usurping and intrusive monarch would be likely to cause to her awful and legitimate sovereignty.

Some portion of the foregoing matter may perhaps be considered as irrelevant to the immediate subject of this chapter, but, on a close analysis, it will be found perfectly applicable to it. There is scarcely any motion of the queen bee, that has not a proximate or a remote relation to the formation or the departure of the swarms; which may be considered, whether in regard to interest or profit, as the most important of all circumstances in the natural economy

of the bee. In the management of the swarms, however, it becomes almost imperative on the individual, who professes to guide the uninitiated through the mazes of apiarian science, to point out to him those errors and fallacies, which the distempered imagination of some pseudo-naturalists has introduced into the practical department of the apiary, an adherence to which will be followed by the most disastrous consequences, and discourage the young apiarian altogether from one of the most pleasing and profitable pursuits of an English garden.

It is generally admitted by all experienced keepers of bees, that a second swarm is very seldom worth preserving, and, in fact, it is a rare occurrence that a second swarm survives the winter in this country. This circumstance may not arise so much from the actual want of honey in the fields, as from the paucity of the number of bees to collect it. At the time when the second swarms are generally thrown off, the richest portion of the honey season is but at its commencement; July and August are the most abundant months in the year for the collection of honey, and therefore, as far as the amassing of their winter store is to be considered, a second swarm stands as good a chance of collecting a sufficiency for its support as a first, and the two following circumstances will show that as the prosperity of a hive greatly depends on its numerical force, it ought to be the aim and study of the skilful apiarian to increase that force by all the means in his power. The numerical strength of a first and second swarm is in the ratio of about three to one. The former generally possesses strength sufficient to amass a sufficiency of food for its winter support, but this is seldom the case with a second swarm. If, however, it should so happen that two second swarms are thrown off the same day, and a junction of them immediately takes place, such a hive then generally stands on an equality with a first swarm, and by the increase of numerical power, the resources of the community are

augmented, and at the close of the season, they will be found to have amassed twenty to twenty-five pounds of honey. The bee-master will in general find it to be his interest to return his second swarms to the parent hives, rather than expose them to starvation during the winter, and himself to the endless trouble and expense of feeding them. Some apiarians indeed recommend that the second swarms should not be joined to a populous hive until the close of the season; and this practice is grounded on the principle, that the proprietor, by joining the second swarm to a populous hive becomes possessed of all the honey, which it may have made during the season; at the same time, that he has enriched his already populous hive by a few hundreds of consuming mouths, when, in reality, they were neither wanted nor desired. Another very valid objection exists to this practice, which is, that it is a very easy matter to speak of the junction of two communities of bees, but the execution of the act is a very different thing indeed; the greater part of the difficulty is however obviated, if the bees of the second swarm be returned immediately to the parent hive, for as they have not yet lost the peculiar odour of the hive in which they were bred, they consequently will be received without any quarrelling or fighting. If, however, the junction be not effected until the close of the season, the mere circumstance of the weaker hive having been originally a second swarm of the stronger one, has no effect on the disposition of the bees towards each other; as all remembrance of each other is obliterated, and as they then appear to each other in the character of entire strangers, all the difficulties of the process of junction are to be encountered, with perhaps the loss of both the hives, merely for the sake of three or four pounds of honey.

We have great and good reason to eulogize Bonner for his skill in many of the practical departments of the apiary, but in the junction of two swarms he was greatly defective. His method consisted of reverting one of the hives and placing the other over it, and having wound a sheet or

a table-cloth round the hives at their point of union, to leave the bees to settle the matter between themselves according to their taste and temper. It would, indeed, be a method highly to be recommended on account of the facility of its execution, were success one of its accompaniments; but seldom in our experiments did that accompaniment fall to our lot; on the contrary, we generally lost one, if not both of the hives. Discoursing once with Bonner on this subject, he informed us, that the loss of the hives was entirely owing to our own ignorance or remissness, for that we had neglected to take a certain preliminary step, which was, to ascertain, previously to placing one hive over the other, the reciprocal feelings of the bees towards each other, which could be easily accomplished by catching about a dozen of the bees of the second swarm, and placing them before the entrance of the populous hive, when the friendly or hostile disposition of the bees would immediately manifest itself, and whether the intrusion of a few hundred hungry dependents, who had in no manner contributed to the amassing of the stores with which their hive might be furnished, was an act to which they would submit without losing their temper, or whether they would revenge themselves upon the intruders by killing them at once. Following the advice of the worthy Scot, we, with all the formality of a court master of the ceremonies, did present about a dozen bees to those of a hive, which we intended to strengthen with the half-starved community of a second swarm, and the consequence was, that we had either selected a moment when the bees were not in a mood to admit any intruders into their hive, or when the intruders themselves had the spirit of foresight working strongly within them, as to the fate which was most likely to befal them, were they to attempt to incorporate themselves with the richer and more pampered members of the more powerful monarchy; whichever might have been the case, all that we gained was, that we placed one hive in a complete state of commotion, and we had the mortification of

seeing the experimental detachment indiscriminately murdered before our eyes.

It is certain that a great advantage may be derived by fumigating the bees of the two hives to a state of stupefaction, and then mixing them together like so many beans in a bushel measure, during which process, one of the queens might be easily caught. This is a plan frequently adopted in Germany, particularly in the great apiaries in the Hanoverian territory, but its success cannot always be relied upon; still, however, it is a plan far more advisable, than that recommended by Bonner.

Notwithstanding that the practical management of an apiary, as well as the natural history of the bee, are by the Germans tinctured with the grossest prejudices and superstitions; yet it must be admitted, that they have in many instances fallen upon some very important discoveries, or they have been the instruments of furnishing those clues, which have led to the discoveries of others. Thus, the Germans have in the various operations in their apiaries always acted upon the principle, that it is by the peculiar odour that bees recognize each other; and so convinced are they of the fact, that when they proceed to give a queen to a hive, they confine her in a little cage, which is placed in the hive, in which she is suffered to remain for about three days. The criterion of the bees being likely to accept of her as their future monarch, is when they are observed projecting their proboscises between the bars of the cage, and administering some nourishment to the imprisoned monarch. In the junction of our second swarms, we however have always been guided by the principle, that it is by the smell that the bees recognize each other; and, therefore, we taxed our ingenuity to devise those means, by which, on their union, all the bees should have the same odour. In order to carry this plan into execution, we diluted about a pound of sugar with about two gallons of ale, adding a small quantity of honey, and a few drops of the essence of

bergamot, or any other odoriferous herb. The whole of the liquid was put into a tub, the upper rim of which exceeded the height of the hive about two inches In the performance of this operation, we originally drove the bees out of both of the hives, but we subsequently improved upon this method, by driving only the bees of the weaker stock, and having gained possession of them, then to immerse them in the fluid, until they were nearly drowned. We then plunge the stronger hive into the fluid, taking care that the whole of the hive be immersed in it, in order that the liquid may reach the very uppermost part of the combs. We allow the hive to remain in that state until it may be supposed that the bees are nearly drowned, when it is taken out, and the bees and the liquid poured into a garden sieve. The bees being in a state of complete insensibility, the task of finding the queens is not one of very great difficulty, when we immediately put them in a tumbler and place them before a fire. The incorporated bees being all returned into the hive, the entrance is closed, and the hive is placed before the fire. In a short time, the resuscitation of the bees commences, which is known by a slight humming noise, and its removal to its place in the garden should take place immediately, unless the weather prove very cold, when the bees ought to receive a greater portion of artificial heat before they are moved into the garden. The restoration of the bees to life being fully ascertained, the larger of the two queens ought to be selected, as the most likely to have been the reigning monarch of the populous hive. She however should not be returned to the hive, until a few bees are seen at the entrance, when she should be placed amongst them, and they will immediately testify their joy by the vibration of their wings, and cleaning every part of her body with their proboscises. In a few seconds she will enter the hive, and perfect harmony will be restored.

In an article entitled, *Observations sur les Abeilles*, inserted in the *Bulletin de la Société d'Encouragement, pour*

l'Industrie nationale, a singular statement is made, and advanced as a verified fact, that two swarms have worked together in the same hive, each having its own queen, and the territory divided equally amongst them, none of the bees of the respective swarms encroaching on the property of the others. It is also remarked that a comb is formed in the middle of the hive from the top to the bottom, as the line of demarcation of the two territories; which comb is not applicable to the general uses of a comb, but is a kind of rude mason work, in which the hexagon figure is completely lost, the whole presenting a rough and uneven surface. The only remark which we can make on this verified fact is, that it is vouchsafed to the apiarians to see greater wonders than to any other order of naturalists.

The above, however, is in a great degree surpassed by a statement of Mr. Gagniard inserted in his "*Traité sur les Abeilles*," in which he states, that he once put three swarms into one hive: two of the swarms declared interminable war against each other; whilst the third observed a strict neutrality, and proceeded to construct their combs, and to nourish the brood. The contest was carried on between the rival swarms with the greatest acrimony for three days; when at last it was determined, like the Horatii and Curiatii, that a certain number should be chosen on either side, and the monarchy awarded to that queen, whose party carried off the victory. Our only remark upon this statement shall be, that if Mr. Gagniard would have informed us of the means by which he arrived at the knowledge of the above facts, we would then not hesitate for a moment to determine whether we would give to them our assent or dissent.

Mr. Gagniard professes himself to be a staunch disciple of the Huberian school, and finding that an unlimited credence had been given to the miracles and wonders of his master, relative to the duels of the queens, he thought perhaps, that he would improve upon the discoveries of his leader, and call upon us to bestow the same degree of

credence upon his account of a regular pitched battle between two swarms, the interest of which must have been intense indeed, especially when the selected combatants were by their skill and prowess deciding the fate of their respective monarchies.

We have previously alluded to the quantity of provisions which the bees of a swarm bring with them from the parent hive, and the probability that by the sudden intervention of bad weather, their stock of food may be exhausted before the bees are enabled to repair to the fields to replenish their store. In this case, no time should be lost in administering to them some food, in which a small quantity of port wine, or other stimulating liquid has been incorporated, which may prevent them so falling off in strength, as not to be able to take their flight into the fields. This food, however, should always be given to them at night, in order that no allurement may be held out during the day to the bees of the stronger hives. In the lifting of the hive for the purpose of depositing the food on the pedestal, great care should be taken not to shake it, nor in any way to handle it roughly: the combs a few days after the introduction of a swarm, are in general very tender, and as the weather is usually hot, great risk is run, owing to the weight of the bees pressing upon them, that the combs will fall down, and thereby prove the ruin of the hive. At all events, the hive should be lifted perpendicularly, and not in a slanting direction, for if there be any vacuum in the hive, great risk is run of the combs snapping, and a great portion of the honey being lost.

If a swarm settles on the ground, it is a certain proof of the extreme fatigue of the queen, and an almost infallible sign, that the swarm will not soon fly away again. In this case, the hiving of it is a task of great facility, for it is only required to place the hive over the bees, and they will in a very short time ascend into it; or it might be advisable to gather about two or three hundred of the bees, and put them into the hive, and then, on placing it over the

remainder on the ground, the latter will cheerfully join their companions in the hive; and should the proprietor be so fortunate as to obtain possession of the queen, and to place her in the hive with only about a handful of her subjects, in a quarter of an hour there will not be a bee on the ground.

It frequently happens that bees will cluster for several days, and even for weeks, before the entrance of the hive, giving the proprietor every reason to suppose that on the present or the following day, the swarm will leave the hive. Day after day, however, the same phenomenon presents itself, and the young apiarian becomes disheartened by such a tedious and fruitless watching. Under these circumstances, Mr. Martin recommends that the temperature of the hive should be raised to an almost intolerable heat, and thereby force the bees to swarm. In answer to this recommendation, we can only affirm that were the temperature of the hive raised to a tropical heat, the bees would not depart, without there was a queen ready to put herself at their head. In the case of the protracted clustering of the bees, it is most probable that the supernumerary queens have been destroyed, and the most advisable plan to be adopted is, either to place a small hive on the top of the old one, cutting a hole of about two inches in diameter, in the latter, or to place an eek of about three bands under the old hive. The former plan is by far the most advisable, as the bees will perhaps fill the smaller hive with honey, which can be taken away at the close of the season, without in the least impoverishing the hive.

We have often tried the following experiment for the purpose of strengthening a weak hive, but we cannot affirm that it has been always attended with success; nevertheless it is an experiment worth trying, at the same time, we must not conceal the fact, that we have sometimes lost a hive in the trial of it. Select a well peopled hive, one, if possible, that has not swarmed; carry this hive to the place occupied by the weak hive, and bring the weak hive to the place

occupied by the strong one. The bees of the latter will rush in crowds into the former with their burdens of farina and honey, and thus an augmentation of power will be obtained, which will render the weak hive able to collect a sufficiency of food for the winter. In order to deceive the bees, it would be advisable to make the entrances of the two hives as nearly similar as possible.

A swarm from a swarm is a rare occurrence in this country, nor is it a very desirable event to the proprietor, as from the lateness of the season, when such a swarm makes its appearance, there is little chance of its amassing a sufficiency of honey to support it through the winter. The honey which is produced by the swarm of a swarm is generally called virgin honey, and is held to be of the purest and most genuine quality, though for what reason, we are at a loss to conjecture. On this subject, l'Abbé Tessier makes some pertinent remarks. He says, "care should be taken that a swarm does not throw off a swarm the same year, in order that it may not be too much weakened. Nevertheless I am certain, that a hive which has swarmed in the middle of May, will swarm again in fifteen days, and a third time in ten days afterwards. Of these three swarms, the first will throw a swarm the same year, by which one hive will have produced four swarms in one year; but this extraordinary case depends on circumstances which take place very rarely. A favourable spring, an abundance of honey and a hot summer, may be accounted as the causes of a multiplication so very wonderful *. In general cases, a person ought to be contented with one swarm, and to prevent that swarm from swarming again by every possible stratagem."

* It is a remarkable fact, that a single hive of bees, at Mr. Clayton's, Charnock Moss, in the summer of 1829, cast four times, two of which casts each afterwards cast twice in the same season, thus producing eight casts of bees, all of which were hived. Whilst Mr. Clayton was hiving one of these casts, another knit amongst the hive, two were hived together, and were afterwards joined by a third cast.

In all cases of virgin swarms, it is the better practice to kill the queen and return the bees to the parent hive. The greater the number of the swarms which a hive throws off, the less is the quantity of honey which that hive contains, and it is a general remark that those hives which swarm three times generally perish in the autumn. If a swarm be placed in a hive too spacious for it, the proportion of wax to honey will be as three to one. On the other hand, the swarms which are put into smaller hives furnish a greater quantity of honey than those in the large ones, for this reason that they employ less of their time in the construction of their combs, and that the bees seldom think of collecting honey, until the combs be finished.

In regard to artificial swarms, as an object of experimental curiosity they may be tolerated, but as objects of profit or of benefit to the proprietor, they ought to be discarded from the apiary altogether. The truth cannot be too strongly impressed upon the mind of every keeper of bees, that one strong and populous hive is worth half a dozen weak ones. The prosperity of a hive, and the harvest that is reaped from it, chiefly depend upon its numerical power; any mode of practice, therefore, which tends to the diminution of that power, must be attended with loss and injury to the proprietor, and to the eventual destruction of the hive. If, therefore, we take into our consideration the formation of artificial swarms, which has a direct and positive tendency to the actual destruction of all numerical power, by the division and subdivision of the community of the bees, we require no further argument to induce every keeper of bees to explode the practice altogether, and to look upon it as fitted only for the fanciful theorist or the speculative amateur. In the establishment of artificial swarms, there is another very serious drawback to be taken into the account, which is, that the swarms are always considered as forming the greater part of the profit of an apiary, whether they be sold immediately

on their acquisition, or kept by the proprietor as the augmentation of his stocks. Now the most effectual method that can be adopted by which that source of profit can be stopped up altogether, is the formation of artificial swarms; for, notwithstanding the assertions of the German apiarians, who may be considered as the founders of artificial swarms, we never yet succeeded in this country in obtaining a swarm from a hive artificially made; and to aggravate the evil, we scarcely ever knew an artificial swarm, which survived the winter, except by mere dint of trouble and expense. Schirach may be considered as the great advocate of artificial swarms, and in this country he found a willing and able coadjutor in Wildman, who at first bruited the formation of artificial swarms as one of the most valuable discoveries in apiarian science. By degrees, however, the light burst upon him, and he gradually retracted his warm eulogiums, for he could not wholly shut his eyes to the disadvantages and the ruinous effects of the system. It was, however, the formation of artificial swarms which raised the great and still unsettled question of the common bees being able to generate to themselves a queen from any egg selected by them for the purpose, and in order to explain this more fully, we will give the description of the different methods of making artificial swarms. The plan of Wildman is, to extract from a hive which has either swarmed or which is on the point of swarming, a piece of comb in which there is a *sealed* royal cell, and to fix such piece of comb in an empty hive. Then he takes from a populous hive a certain number of bees, which he introduces into the hive, in order that they may bring the royal nymph to maturity, and thereby found a monarchy of her own. On the other hand, Schirach maintained, that it was by no means necessary that the egg so transported should be a royal one, for the bees possessed in themselves the power of metamorphosing the egg, which at its maturity would have produced a common bee or a drone into a royal

one, the issue of which would be a queen as perfect and fully organized, as if she had emanated from a genuine royal egg. We have already discussed this question fully in Chap. IV. and having, we hope, successfully refuted the hypothesis of the alleged power of the common bee to generate a queen from a common bee, on the ground of its direct variance with all the analogies of nature, we of course enter our caveat against the practicability of forming an artificial swarm according to the system of Schirach, and that we give our unqualified assent to the principle of Wildman, namely, that the egg introduced into the empty hive must be a royal one.

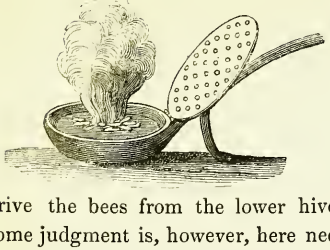
We, however, object to the method of both Schirach and Wildman, and for the very cogent reason, that we never could succeed in retaining the bees in the hive unless they had actually a queen with them, and that, in every instance when we tried the experiment, we never could discern that the bees paid the slightest attention to the eggs in the comb, whether it were a royal or a common one.

To those, however, who may wish to enjoy the *amusement* of making an artificial swarm, we will lay down the system as adopted by ourselves, and which was practised more for the purpose of verifying particular circumstances in the economy of the bee, than from any predilection for the practice, or from any intention of making it a general rule of our management.

The first point to be ascertained is the existence of drones, without which it will be in vain to attempt the formation of an artificial swarm. It must however, be particularly considered, that the system of operation differs according to the shape of the hive in which the bees reside; and of all shapes the common bell hive is the most inconvenient, and we may add, not only for this experiment, but for almost all the experiments that are made with bees. As we have totally discarded that kind of hive from our apiary, and make use of no other but those of our own invention, we must

describe the operation as performed in those hives, and which offer every facility for the purpose. In the formation of an artificial swarm from the common straw hive, it becomes necessary to revert it, and then placing an empty hive over it, to drive the bees, by knocking at the sides of the hives, from the lower into the upper one. This knocking at the sides of the hive, unless performed with great caution and care is apt to break the combs, whereas in our hive, we have recourse to the simple process of fumigation, which is at once speedy and efficacious; the necessity in being compelled frequently to lift the common straw hive, in order to ascertain the progress of the bees from the lower hive into the upper, is another very serious drawback in the operation of this experiment; whereas in our hive, by simply removing the top, the interior state of the bees can be ascertained without the slightest risk or molestation.

The most seasonable time for the performance of the experiment is from seven o'clock A M. to one P M. the weather propitious, and the bees busy at their labours. In all our experiments we prefer the middle of the day to any other time; a considerable number of the bees are then in the fields, and they are too intent upon their own labours to pay any attention to the inroads which are making upon their works or property. Having opened our hive at the top, and taken away the flap board and the netting, we immediately apply the board constructed thus: the necessity of which is obvious, as the lower part of the hive being smaller in diameter than the upper, no junction can be formed so exactly as to prevent the bees from creeping out at the sides. Having procured some tinder made either of dried leaves, rags, or dried cow-dung, we insert the



accompanying fumigating machine under the hive, first supporting it by four wedges of wood. The smoke, which should not be very intense, will soon drive the bees from the lower hive into the upper one: some judgment is, however, here necessary to determine the exact period when a sufficient number of bees have ascended into the upper hive, which ought to amount at least to about five or six hundred, when the fumigating pan should be removed, the lower hive returned to its original position, and the upper one taken away.

It is now, however, that the most important and difficult part of the experiment is to be decided; which is, whether the queen be in the upper hive or the lower. This problem may certainly be solved by waiting about eight or twelve hours, when the condition of the bees in the upper hive will at once determine the absence or the presence of the queen. If the former be the case, the bees will not have commenced the construction of their combs; they will appear in a wild and agitated state, running about all parts of the hive as if in search of something, nor will they ever cluster at the top, as is always the case, when they have a queen with them. In order, however, to ascertain at once the presence of the queen in the upper hive, a slight fumigation may be given the bees, so as to stupify them, and an examination be immediately made; and if the fact be ascertained that the queen is amongst them, the new hive must be removed to the distance of two or three hundred paces from the old hive, in order that the community belonging to the first swarm may lose all recollection of their former habitation. Indeed, it would not be a bad practice to remove the old hive to another position, in order that the bees of the new swarm,

not finding their own domicile in its accustomed place, will willingly return to the hive from which they departed.

Another important point now presents itself, which is, the examination of the old hive, for the purpose of ascertaining if there be in it an embryo queen; and in our hive this examination is easily effected. In the common straw hive, however, the difficulties are almost insuperable, arising from the almost impossibility of examining that part of the combs in which the queen cells are situated. If the artificial swarm has been formed without previously ascertaining if the bees remaining in the old hive were furnished with another queen, a considerable risk is incurred of the old hive perishing altogether: it is in fact these contingencies of so critical a nature, which render the formation of artificial swarms so very dubious and precarious. In artificial swarms, every thing depends on the presence of a queen, for we treat the rearing of a queen by the bees from a common egg as the mere effect of a romantic fancy. If on examining the old hive, there be no traces found of a queen to supply the loss of that which has migrated with the artificial swarm, the better plan will be to restore the bees with the queen to their former domicile, than run the risk of losing all the bees by keeping them in a state of separation.

If it be ascertained that the queen is not in the new hive, the only method to be adopted is to endeavour to obtain a queen, either from the parent hive, or from one that has just swarmed; but where is the benefit of all this excessive trouble, to obtain an end to which after all no positive advantage is attached. The capture of a queen bee in a hive is a task not easily accomplished; and we will defy the most skilful apiarian to fulfil it without driving all the bees out of the hive, an operation which sometimes takes three or four hours in the execution.

Ducarne recommends, that on the departure of a swarm, for a person to place himself before the hive, and very little

doubt exists, but he will see one or two queens come out, when he may take one of them a prisoner, and the object which he has in view is then obtained. This is a most sagacious recommendation on the part of Mr. Ducarne, but it is of equal validity as the recommendation to the boy to catch the birds by putting salt on their tails. A person may watch the departure of a swarm a hundred times before he will be able to catch a glimpse of the queen; and then her motions are so excessively rapid, that it must be under a combination of very extraordinary circumstances indeed, that she can be taken a prisoner: indeed Mr. Ducarne was in some respects aware of this difficulty, for he recommends the person, on his failure to entrap a queen bee on leaving the hive, to follow the swarm, and as soon as it has settled, to commence an examination of the bees, and the queen will be discovered, when she can *very quietly* be taken possession of, and conveyed to the expectant community in another hive. This is indeed verifying the old adage of robbing Peter to pay Paul; for, on the well grounded supposition that only one queen departs with the swarm, and which may be considered as an established fact, if all the bees cluster in one place, what advantage has been gained by depriving a swarm of its legitimate monarch, and thereby effecting its ruin, for the mere purpose of bestowing her upon another community, less valuable perhaps, and certainly less numerous than that from which she has been taken? We must also enter our protest against the probability of catching the queen at all, whilst the bees remain in the clustered state. Seldom did we ever see a queen, as Ducarne represents it, walking on the outside of a swarm; she is most generally in the very kernel of the cluster, and to attempt to catch her in that state would be a task, which the greatest enthusiast would very soon be glad to relinquish.

We consider it useless to pursue this subject any further. The formation of artificial swarms is exploded from the

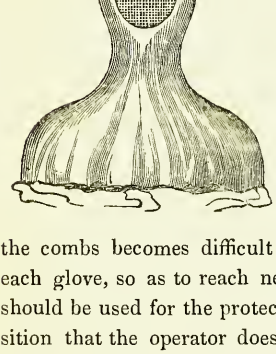
practical department of the apiary, as directly injurious, and utterly destitute of any of those advantages, which the founder or the abettors of the system considered it to possess.

The French apiarians, wishing to improve upon the system of Schirach, introduced a plan of augmenting the number of hives by dividing the swarms, which they called *essaims forcés* (forced swarms). This plan is, however, but a modification of the system of Schirach, possessing all its disadvantages, without any attendant profit.

In all the operations with bees, and particularly with swarms, we cannot too strongly recommend every one to use that protection, which will place him beyond the power of the infuriated insects to inflict a single wound upon him. It is no sign of courage to enter upon the execution of a task, which is accompanied with danger, and to despise or to discard those means, by which that danger may be obviated or averted. Such conduct degenerates into mere rashness and fool-hardiness, whereas in all the actions of man, whether they have a relation to himself or to the objects of his immediate employment or pursuit, a consciousness of safety imparts to him that coolness and presence of mind, which in many transactions are absolutely indispensable in order to insure success, and perhaps in no instance are they more requisite than in the transactions of an apiary. A dozen stings are no trifling injury ; with six only, we have seen a person confined to his bed, and his face so swollen that scarcely a feature could be recognized. It becomes, therefore, the extreme of folly to enter upon any of the experiments, or even the commonest points of practice with bees, without a complete and efficient safeguard. A common veil will in many instances suffice to protect the face, but the bees appear to possess so much cunning, that they will insinuate themselves through the smallest opening, and when the operator thinks himself secure, he will on a sudden experience

to his cost that the insects, with which he has to deal, have completely outwitted him.

The most approved apparatus is a hood made of linen, large enough to throw over the head, and to fall below the shoulders, and fastened round the body by strings, to prevent the bees from slipping underneath: a mask should be made of iron wire, like the accompanying sketch, which is preferable to glass, horse-hair or gauze, as being more open, and less accompanied with those suffocating effects, than either of the afore-mentioned materials. The hood, when complete, presents the following appearance.



The gloves should be of the coarsest leather, such as the housemaids' gloves are made of, through which no sting can penetrate; at the same time, the leather towards the fingers should be of the most pliant kind, for if it be stiff and unbending, any operation with the combs becomes difficult: a sleeve should be affixed to each glove, so as to reach nearly to the elbows, and gaiters should be used for the protection of the legs, on the supposition that the operator does not wear boots, which are in themselves a sufficient safeguard: with this armour, a person may defy a whole swarm of bees. We generally make a small hole through the mask, for the purpose of admitting a tobacco pipe, which being filled with dried leaves, or even pounded tea, we have found to be of essential service in driving away the bees from any particular quarter, which is intended to undergo examination. A single puff or two will be found quite sufficient, for there is not anything which is more annoying to bees, or by which their irascibility is more

effectually quelled, than smoke. The smoke of tobacco, however, should never be used; its pungency is too powerful for the bees, and it leaves behind it that unpleasant odour, which is so offensive to them, that they will frequently forsake their hive, rather than dwell in it. In all operations with bees, the breath should be withheld as much as possible; to breathe upon bees is the surest method of exciting their anger, and particularly, if the breath be of an offensive character. Some persons attach great importance to the dress, and recommend that the clothes should not be of a dark colour; we however consider this to be founded on mere conceit, for we never knew the conduct of the bees to be regulated towards us by the kind of dress which we might wear at the time. The sole study of the bee appears to be, to get at the hands and face, as being the most vulnerable parts; but as to the dress, it is of no moment, whether it be a court-dress or a smock-frock, in fact, we should prefer the latter to the former.

NINTH CHAPTER.

INSTRUCTIONS FOR THE FEEDING OF BEES.

ERRONEOUS SYSTEM OF FEEDING ADOPTED BY THE COTTAGERS OF THIS COUNTRY—COARSE BROWN SUGAR A USELESS FOOD FOR BEES—THE SPRING AND THE BEGINNING OF WINTER THE BEST TIME FOR FEEDING—FOOD TO BE GIVEN IN ABUNDANCE—NOT TO BE GIVEN AT INTERVALS—THE CANDYING OF FOOD IN THE CELLS PREJUDICIAL TO BEES—A SUPERABUNDANCE OF FOOD NOT TO BE GIVEN—THE PREFERENCE TO BE GIVEN TO PERIODICAL FEEDING—QUANTITY OF FOOD TO BE GIVEN AT ONE TIME—BEES NOT TO BE KEPT TOO WARM IN WINTER—THE EAGERNESS OF THE BEES FOR FOOD, A CRITERION OF THEIR HEALTH—DURING THE FEEDING IN THE SPRING, THE HIVES TO BE PROTECTED FROM ROBBERS—UPPER AND LOWER FEEDING—HONEY THE BEST FOOD FOR THE BEES—DIRECTIONS FOR MAKING A PROPER FOOD—METHOD OF FEEDING IN THE COMMON HIVE—PROCESS OF FEEDING IN THE HUISH HIVE—THE FOOD TO BE COVERED WITH STRAWS OR PAPER—DIRECTIONS FOR TOP FEEDING IN THE COTTAGE HIVE—ERRONEOUS OPINION AS TO THE EFFECT OF FEEDING ON THE BEES—THE ADMINISTRATION OF FOOD NOT TO BE DELAYED—ERRONEOUS SYSTEM OF THE FRENCH IN THE FEEDING OF THEIR BEES—FLOUR RECOMMENDED BY DUCOUEDIC AS FOOD FOR BEES—INJURIOUS EFFECT OF IT—LOMBARD RECOMMENDS BRANDY—DU HUMEL RECOMMENDS RUM TO BE MIXED WITH THE FOOD—THE CONSUMPTION OF THE QUANTITY OF FOOD DEPENDS ON THE STRENGTH OF THE HIVE—QUANTITY TO BE GIVEN TO A HIVE, ACCORDING TO HUBER—HONEY NOT CANDIED IN THE CELL BY ANY COLD IN THIS COUNTRY.

THERE is, perhaps, scarcely any department of the apiary to which less attention is paid than to the feeding of the bees, or in which a more erroneous system of management is more generally adopted. If we examine the manner of feeding adopted by the cottagers of this country, the above remarks will be found to be amply verified. We have frequently attempted, though in vain, to instil into the minds of those prejudiced and superstitious people, an improved method of feeding; but we always found them so riveted to their antiquated habits, that all advice appeared to be thrown away upon them. The old dames, in the fulness of their bounty, and in the unbounded conceit of their own superior judgment, determine on a sudden to feed their bees, without perhaps consulting their actual necessity or the season in which the food is administered. They proceed to buy about

a quarter of a pound of coarse brown sugar ; which having obtained, they repair to the first alder-bush, and having cut off a branch, the pith is scooped out, and the vacuum filled with sugar. It is then thrust into the opening of the hive, and the provident dame sits down to her needle, with the pleasing satisfaction that she has performed her duty towards " the poor creatures." Should the hive happen to die during the winter, it is not the eloquence of a Cicero or a Demosthenes which would convince her, that the death has been occasioned from a want of food ; whereas in regard to any actual benefit, which her bees derived from the food which she did give them, had she given them a good plate full of potted beef, the bees would have been as thankful for it. It is only by the proboscis that the bee imbibes its food, and consequently that food must be liquid ; it will nibble at the sugar with its forceps, but as to any deposition of it in the cells, it is wholly out of the question.

The spring and the beginning of the winter may be considered as the two proper seasons for the feeding of bees, but the principle on which it is administered in each of those seasons, is of a distinct character. The feeding of the former season is frequently adopted to cheer and invigorate the bees, whereas that of the latter is purposedly administered to them for their support until the return of the honey season. There cannot be a more erroneous method adopted than that of a niggardly system of feeding : feed well and plentifully, or not at all. We were in the early periods of our apiarian education, an advocate for the administration of food to bees at intervals ; but we have had cogent reasons for altering our opinion, and especially as far as regards the winter feeding. When the bees have once assumed their hybernating state, every thing that tends to disunite them, cannot but prove injurious. The temperature of the hive becomes diminished, which is chiefly maintained by the reciprocal heat of the bees, and many of the insects become so benumbed, that they can-

not ascend amongst their clustered companions. If, however, the time of feeding be chosen when the weather is fine, we would advise that several soup-platefuls should be given at a time. The bees will deposit in their cells what they cannot immediately consume, and all danger of immediate or future want is obviated.

There is another fatal objection to the method of feeding adopted by the country people, which consists in the food administered by them candying in the cells, which not only renders it of little or no use to the bees, but is highly prejudicial to them, as the combs become in a manner useless; a considerable time is also wasted by the bees in the cleansing of the cells from the obnoxious matter, which would otherwise be more profitably employed. All food which is administered to bees should previously undergo the process of boiling, by which all danger of its candying is obviated.

In the recommendation of the administration of a plentiful supply of food, we do not wish however to be understood as advising that a lavish quantity should be given; for as extremes in everything are attended with evil, so it is in the feeding of bees, for too much food is as injurious as too little; and this arises from the natural greediness of the bees for any food which they can deposit in the cell, and if a superabundance be given, rather than relinquish the treasure, they will fill the brood combs with it, and in a great degree spoil them for the future reception of the eggs of the queen. We have in several instances known the fructified eggs of the preceding season destroyed by a lavish mode of feeling, for the bees appear to entertain such an innate sense of the fear of hunger, that every other consideration seems to vanish before it.

Considered from that point of view, periodical feeding appears to possess the superiority over an abundant supply of food at one time There is, however, one rule by which the apiarian may be guided, and that is, by the extent of the

population of his hives, some being weaker and some stronger, and by which a comparatively accurate estimate may be formed of the quantity of food, which they will require to support them through the winter. To a strongly peopled hive, we would advise not less than four pounds to be given at one time, and never less than two to the weakest. This quantity will suffice them at least for a month or six weeks, according to the severity of the weather. The greater the cold, the less desire have the bees to eat, and it is on that principle, that we ground our objection to the hives being kept warm in winter. The grandmothers, who put on an extra flannel petticoat in the winter, judge by analogy that their bees should also have an extra clothing given to them, and consequently all the old blankets, carpets, and matting are gathered together, wherewith the hives are to be covered, that "the poor creatures" may not be frost-bitten; whereas had the hives been placed in an icehouse, neither their health nor their lives would have been endangered.

At the time of feeding the hives, a pretty correct judgment may be formed of the state of the health of the bees. If they exhibit their usual signs of irascibility; if they evince an extreme greediness in the consumption of the food, and if some of the bees are seen fluttering with their wings and making the usual sound, indicative of delight, it is a certain criterion of the good health of the bees, and with the exception of a want of food, which in a certain degree depends upon the vigilance and management of the proprietor, no fear need be entertained for the safety of the hive. If, on the other hand, the food remains in the hive without being touched, although it is evident that there is a scarcity in the hive, the proprietor should then be on his guard and examine the state of the hive very narrowly. Some radical defect will soon display itself, and he may, unless it be discovered, anticipate the loss of his hive before the return of the spring. There is nothing more discouraging to the apiarian, than the

preservation of weak hives through the winter, and we will venture to predict that he, who has gone through the task one season, will not readily subject himself to the trouble and anxiety of a second; and even if success should crown the efforts of the persevering proprietor, to save his hives through the winter, it is by no means a certainty that they will repay him by any after produce that they may bring him.

In the feeding of bees in the spring, the greatest caution must be observed to protect the hives from robbers. The bees are then on the alert, and their sense of smell is so acute, that they will scent a hive in which the food is administered at a considerable distance; and supposing that the hive be strong enough to resist the attack of the robbers, still the annoyance which it receives, proves of considerable injury, as it diverts them from their usual labour, and keeps the bees in a continual state of commotion. The most seasonable time for the feeding of bees, is immediately after sunset, when the labours of the day are nearly at a close, and all the bees have returned to their respective homes. The necessity of closing or contracting the entrance need not then be resorted to, but the vessel in which it is administered should be taken away as soon as possible.

There are two methods of feeding, upper and lower; the former however can scarcely ever be adopted with the common cottage hive, but with our hive it is effected without the slightest trouble or inconvenience.

Previously, however, to entering into a specification of the two methods, we will describe the method and the articles of which the food ought to be made. Honey is undoubtedly the best food that can be given to the bees; but in the state in which it is purchased in the shops, it is next to being useless altogether, and indeed it must undergo the process of clarification, before it can be made applicable to the use of the bee. The expense is also great, independently of

its being seldom within the reach of the cottager, who generally disposes of his honey, as soon as he has obtained possession of it. The cheapest and best kind of food for the cottager, and indeed we may add for the more opulent proprietor, is a compound of ale, moist sugar, and a small quantity of salt, in the following proportions: To two quarts of ale, put one pound and a half of coarse moist sugar, and about half an ounce of salt. Bring the mass to a boil, skimming it the whole of the time; and when the sugar is wholly dissolved, pour the liquid into an earthen vessel, and let it stand till it be cold. It ought then to possess the viscous consistency of honey, and when a portion is lifted with a spoon, it ought to be ropy and glutinous, for if it be too thin, it will be apt to run out of the combs. In order to give the mixture a greater degree of consistency, about half a pound of treacle, incorporated and boiled with the other ingredients, will be found of great service.

In regard to the manner of administering the food, the method must necessarily vary according to the make and fashion of the hive. In the common cottage hive, the following is the process. An eek must be provided of the same circumference as the hive, which can easily be obtained by cutting off the three lower bands of an old hive, taking only the precaution not to let the bands be in that rotten or decayed condition as to sink with the weight of the hive. Fill a soup plate with the mixture, and place it on the pedestal of the hive. If the proprietor can obtain an assistant in this operation, the execution of it will be far more easy and expeditious. Let one person gently lift the hive; let the other place the eek on the pedestal, with the plate of food in the middle; the hive may then be placed on the eek, and the bees left to regale on the banquet provided for them. The plate must be removed early in the morning, whether the bees have consumed the food or not; for the bees are

sometimes of that fickle disposition, that they will refuse their food on one day, which they will eat greedily on the following one. If the bees have eaten the food, the plate may be filled again on the subsequent evening, and we consider that two platefuls will be amply sufficient for one feeding.

In the Huish hive, the process of feeding is very simple and easy. The cover of the hive being taken off, the plate is put in the middle of the flap board, and the two side flaps are raised, giving the bees free access to the place where the food is deposited. The top of our hive is well adapted for feeding, having five or seven flaps according to the option of the proprietor. Thus the two side ones being opened, a sufficient space is given for the plate, and we have often found that the bees will *ascend* to eat, when they will not *descend* to it; and this we suspect arises from their repugnance to descend into a colder temperature, whereas in the upper part of the hive the temperature remains the same. This system of feeding is attended with the very great advantage, that every fear is obviated of an attack from robbers. It is only the inmates of the hive that can have any access to the food, and it is deposited in so secret and inaccessible a place to all stranger bees, that the entrance of the hive may be left in its usually open manner, without any fear of an intruder making his way into the hive to participate in the sweets.

In both upper and lower feeding, but particularly in the latter, the liquid should be covered with straws, or paper perforated or cut into nicks, so as to prevent the bees from falling into it and being suffocated. We have known the bees so greedy after their food, that they have actually nibbled away a great portion of the paper, which has been saturated by the mixture.

The method of feeding differs materially in the winter and in the spring; in the former, the bees from their torpid

state will seldom descend to the platform to partake of the food, and in this dilemma, it must be allowed that the cottage hives present a difficulty not easily to be overcome. Top feeding ought always to be adopted in the winter, in preference to feeding on the platform, and with the cottage hive we recommend the adoption of the following plan. Cut a small hole in the top of the hive, and having filled a phial or other necked vessel with the food, cut a small nick in the cork of the bottle, over which put a piece of linen or other substance, through which the liquid can gradually distil, then insert the bottle with the neck downwards into the opening of the hive, and the food, then slowly and gradually falling upon the combs, will be greedily taken up by the bees and deposited in their cells.

It is the opinion of some apiarians, but it is grounded on fallacy, that feeding bees is apt to render them lazy, and they found their opinion upon the principle, that if animals have food provided for them, they will not go in search of it. This may indeed hold good with human animals, but the sense of labour is so inherent in the bee, that no artificial means whatever can destroy it. We consider feeding even to those hives, which do not require it, highly beneficial, and we hesitate not to affirm that a hive to which some food has been given in the spring, will swarm earlier than one to which it has been denied. It imparts vigour and animation to the common bees; it accelerates the deposition of the eggs of the queen, and excites them to the more early prosecution of their labours. We can with truth affirm that no proprietor of hives will find a pound or two of sugar, and a quart or two of ale thrown away upon his bees.

It is an erroneous practice to abstain from the feeding of bees until they be actually in want of food. The simple knowledge that any particular hive is poor in provisions, ought to instruct the bee master to administer such food to it in due season, that the bees may be able to retain their

natural strength and health, and not allow them to be so reduced by want, as to be scarcely able to imbibe the food which is presented to them. A farmer does not allow his cow nor his horse to be so debilitated for want of food, as to be unable to perform their customary labours, and it is well known that in all creatures, whether they be biped, quadruped, or like the insect multipede, their physical powers cannot be regenerated nor restored to their pristine vigour, if allowed to sink below a particular degree: and it is similarly constituted with the bees; a protracted abstinence from food renders them eventually so weak, that they appear to lose all their natural vigour, and become at last so dispirited, that they die off by degrees, and the proprietor has then to attribute his loss solely to his own improvidence and neglect.

There is no department of apiarian economy in which the French are more ignorant than in the feeding of their bees; nor should we have considered their system as worthy of the slightest notice, were we not aware that their prescriptions have been followed by several keepers of bees in this country, and who have consequently lost their hives; but it was impossible to impress the conviction upon their minds, that that loss was occasioned by an injurious system of feeding. Thus, Mr. Ducouedic, who as a practical apiarian is in some respects worthy of the highest consideration, recommends a quantity of flour to be mixed with the food; but on what ground that substance is recommended, we are at a loss to conjecture. As far as our opinion may be valid, we should consider the admixture of flour or of any other farinaceous substance, as a direct deterioration of the food, and carrying with it a positively injurious effect upon the health of the bees. Flour is as much the natural food of the bee, as a rumpsteak is the food of a horse, and its incorporation with any artificial food, which may be given to the bees will most probably give them the

dysentery, and set their hoarded food in a state of fermentation.

Lombard recommends brandy to be mixed with the food, in the proportion of half a quartern to a quart of the liquid. Du Humel thinking to improve upon the recommendation of Lombard, suggests the admixture of some rum. We advise our English bee keepers to drink the brandy and the rum, and to give their bees nothing but sugar and ale.

M. Reich of Sablath makes use of the following substitute for honey: "Take a certain quantity of pears, the sweetest that can be procured, and having baked them in an oven, with seven or eight pints of water, let them boil until reduced to about six pints, and the liquid has attained the consistency of syrup, similar to that of honey. The mixture must be filtered, and a small quantity of sugar added to it. M. Reich affirms that this mixture has the undoubted property of invigorating and strengthening the bees. Huber recommends a mixture very similar to it, with the exception that the pears are not previously baked.

It is scarcely possible to form a correct calculation of the quantity of honey which a hive will consume during the winter, as it depends upon so many contingencies, which set all calculation at defiance. The consumption of food depends in the first place on the strength or weakness of the population; secondly, on the mildness or severity of the season; and, consequently, no positive data can be laid down by which the consumption of a hive can be ascertained. Hunter made a calculation, which is inserted in the Philosophical Transactions, that from the 8th of October to the 9th of February, the bees consumed within one ounce of four pounds. This hive was, however, not a very populous one, and he therefore draws the conclusion that a well-peopled hive consumes about a pound a month. But here the variation of the weather may intervene, and the consumption of

one season would therefore not agree with that of another, even supposing that the hive were similarly constituted in regard to its population. Mr. Huber made the experiment with five hives *, giving to each three pounds of food, and he succeeded with that quantity in preserving them through the winter.

There is no cold so intense in this country as to candy the honey in the cells, although the contrary has been asserted by some native apiarians, particularly Bonner; but, should it ever have taken place in this country, it must be ascribed to some other cause, than the effect of cold; but the real one could not be immediately discovered.

* Lettres Inéds. de M. Huber, du 15 Avril, 1810.

TENTH CHAPTER.

DESCRIPTION OF THE DIFFERENT HIVES, DOMESTIC AND FOREIGN, SPECIFYING THEIR ADVANTAGES AND DEFECTS.

FIRST MENTION OF HIVES BY VARRO—THE FORESTS, THE NATURAL DOMICILE OF THE BEES—COLONIES OF BEES IN POLAND, RUSSIA, &C.—SYSTEM OF KEEPING BEES IN POLAND—THE POLISH HIVE—THE COMMON COTTAGE HIVE—OBJECTIONS TO IT—NUMBER OF HIVES INVENTED—FEW HIVES INVENTED IN ENGLAND—HIVES INVENTED BY FOREIGNERS—THE HIVE OF GELIEU—THE STORIFYING HIVE OF RICOUR—THE STORIFYING HIVE OF L'ABBÉ ELOI—NUMEROUS MODIFICATIONS OF THE STORIFYING HIVE—HIVE OF DUCOUEDIC—ADVANTAGES OF THE STORIFYING SYSTEM AS LAID DOWN BY DUCOUEDIC—THEIR EXAMINATION AND REFUTATION—THE WEIGHT A GOOD CRITERION OF A SWARM—THE GOODNESS OF A SWARM NOT ALWAYS TO BE ESTIMATED BY ITS SIZE—REASONS THEREOF—THE DISJUNCTION OF THE BEES INJURIOUS—INVESTIGATION OF THE GENERAL MERITS OF STORIFIED HIVES—HIVE OF LOMBARD—HIVE OF HUBER—HIVE OF HUBER MODIFIED BY MR. FEBURIER—THE OPEN HIVE OF MESSRS. MARTIN OF CORBEIL—THE HIVE IN PORTIONS OR FRAGMENTS BY MR. BEVILLE—THE HIVE OF MADAME VICAT—THE MIRROR OR EXPERIMENTAL HIVE—THE HIVE OF WHITE—THE HIVE OF SIR CHARLES WHITWORTH—THE SAME AS THE HIVE OF THORLEY—THE HUISH HIVE—BEST MATERIALS FOR THE CONSTRUCTION OF HIVES—SINGULAR BEE HIVE OF MONSIEUR BELIZE AT LIBEAU—NUMBER OF HIVES INVENTED—NUMBER OF MODIFIED HIVES—GENERAL REMARKS ON HIVES.

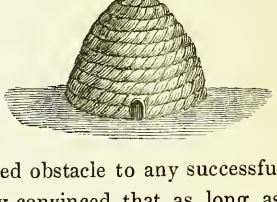
VARRO is the first author, who mentions hives as the domicile of the bee, but in his description of the particular one adopted by him he is so vague and indefinite, that its exact construction cannot be ascertained; we have however good reason to suppose that it was made of straw and of a circular form. Since his time, hives of all kinds and dimensions have been constructed, differing in their materials and properties, and varying as much in their comparative excellence as in their utility.

It cannot be doubted that the forests were originally the natural domicile of the bee; but the love of property influencing the minds of our ancestors, led them to the adoption of the plan of appropriating to themselves the swarms, which issued from the trunks of trees, and by the invention of a com-

modious dwelling, to secure to themselves exclusively the profits of their labours. We are borne out in the truth of the above remark by the circumstance, that even at the present day, the bee is in many parts of Europe, still in the savage state. In Poland, Russia, and many adjacent countries, there are no regular bee hives; the hollows and cavities of the trees being the places of their habitation, but still they are not considered in the character of *ferœ naturæ*, for the lords of the soil derive a considerable revenue from the farming of particular districts, the value of which is estimated according to the number of the colonies of bees, which they may contain. The price of a district varies from 5*l.* to 25*l.*, and although the rights of the farmer of it are scarcely ever invaded, yet the difficulty of identifying the swarms is a source of continual feuds. The first step which the Poles made to the domiciliating of the bee, was to hollow out a piece of a middling sized pine tree, of about two yards in height, making an opening in front of the whole length of the hive, by which the comb is extracted, and which is made to open and shut at pleasure by two hinges. From the contracted limits of this hive, the bees seldom made more than one or two combs; and, indeed, the general management of their bees by the Polish peasants, is so directly opposite to all good practice, that it scarcely deserves the slightest mention.

The trunks of trees were also used in Germany as the original hives of bees, and they were placed perpendicularly in a row, having the direct appearance of a number of clumsy logs of wood. In Spain, the trunks of the box trees are to this day used as bee hives; and the natives of the country entertain the opinion that the odour of the wood is so agreeable to the insects, that both their health and fecundity are promoted; which, after all is perhaps nothing more than the effect of the superiority of the climate.

It is well known that the hives in this country are generally made of straw in the form of a bell, and although no immediate objection can be made to the shape, yet in many of the necessary operations with the bees, and especially in the act of deprivation, it is a decided obstacle to any successful result; and we are thoroughly convinced that as long as the bell hive is in use, the system of suffocating the bees will be persevered in. There are few persons possessed of the necessary courage or presence of mind to undertake the deprivation of the common straw hive; and even when it is done, the side combs are so very small, arising from the contracted segment of the circle, that they are scarcely worth extracting. As to the immediate difficulty of depriving the hive, it is by no means so great as is generally imagined in relation to the bees, for a little smoke will soon drive them away from the combs intended to be extracted; but the cottagers in general appear to entertain so great a dread of turning up a hive, that they deem the man but little removed from a lunatic, who attempts it. Perhaps under no circumstances is the bell-shaped hive attended with more injurious consequences, than when the combs are suffering under the depredations of the wax-moth. With the knowledge that these destructive insects are carrying on their ravages in the interior of the hive, as well as the certainty that inevitable ruin must befal the hive, unless those ravages be stopped, the proprietor sees it impossible, on account of the make of the hive to cut out the combs, which the moths have begun to perforate, and in which they are about to lay their eggs. No possibility whatever exists of penetrating to the upper parts of the hive; and, thus, the proprietor is very often deceived as to the health and prosperity of his bees; for as no imme-



diate injury is observable at the bottom, he is apt to conclude that no danger awaits his hive at the top; and thus he is lulled into a false security, when in a few weeks the painful truth comes upon him, that his hive is gone, past all redemption. It is with the conviction impressed upon our minds, that no real improvement can take place in the management of bees so long as the cottage straw hive is in such general use, that we wish to see it exploded altogether; although we are ready to confess that the whimsical and fanciful inventions of many apiarians in the construction of their hives, have tended rather to the increase, than the diminution of the evil. The expense attending the construction of the majority of hives is so great, as to deter the cottager from even thinking of the adoption of them; and they therefore have recourse to that shape, which is the easiest to be procured, and which in their opinion exceeds all others in its superior properties. We are far from recommending a glass or a wooden hive, on account of the greater facility which they are supposed to bestow of watching the motions of the bees; for we most firmly protest against the power of witnessing their secret operations, as some fanciful naturalists have asserted, from the very foundation of a cell to the copulation of a queen with a drone. It does not admit of a doubt, that all the knowledge which is obtained of the interior economy of a hive is extracted from the inmates of it by direct compulsion, and the most persevering industry. A more convincing proof cannot be given of the extreme aversion which the bees evince from any public inspection of their labours, than were a swarm to be put into a glass hive, without any immediate outward covering, the bees would in a very short time give the whole of the interior of the hive such a thick coating of rude wax, that no light whatever could penetrate through it, and it is for this reason, that we always call into question the truth

of those experiments, which are said to be the result of the examination or the inspection of the interior of a hive, and which could not have been accomplished without the admission of light.

We are speaking within compass when we say, that above a hundred hives have been invented, some being modifications or improvements of preceding inventions, and others professing to be wholly original. There was not however one of these inventions, which did not establish its claim to general approbation on the ground of its superiority, whether for the extraction of the combs, the augmentation of the produce, the promotion of the fecundity of the queen, or the increased facility of obtaining a more correct knowledge of the natural history of the bee.

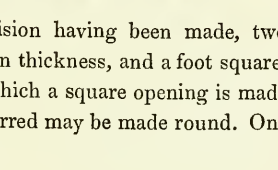
The English cannot lay claim to any great merit for their ingenuity in the construction of hives; those of Wildman, White, Keys, Thorley, and others, being all mere modifications of the hives invented by the French and German apiarians, and to which in many instances, the character even of an improvement could not be attached. In France, the following naturalists have signalised themselves in the construction of their hives, some of which are founded on good and sound principles of practice, whilst others can only be stigmatized as some wild abortions of an exuberant imagination. Amongst the most scientific artists, we may enumerate amongst the French, Feburier, Duchet, Palteau, De La-bourdonnaye, Bosc, Eloi, de Boisjugan, Ricour, de Massac, Montfort, Martin, Beville, Caignard, Ducouedic, Lombard, &c. In Germany, Engel, Cuingheim, Rompel, Humel, Wentzel, Riems, Kästner, Schirach, Herold, Steinmetz, Neidhart, &c. In Italy, Falchini, Gil. In the Archipelago, l'Abbé della Rocca, and in Switzerland, Huber, Gelieu, and Vicat.

We will give a brief analysis of the most ingenious of these

hives, leaving the experimental apiarian to adopt that which is the most agreeable to his taste.

THE HIVE OF GELIEU.

This hive is very convenient for the formation of artificial swarms, and, in fact, Gelieu had that object chiefly in view when he invented it. It is in the form of a box, which, measured within, is a foot in height, nine inches in breadth, and from fifteen to eighteen in length. The two first dimensions ought never to vary; but when it is intended to make the hive larger or smaller, the length may be enlarged or diminished. The boards of which it is made, are one inch and a half thick. By these means, without the aid of any covering, the bees are fully protected from the excessive heat of the sun and from extreme cold. The honey is not exposed to liquify, nor the wax to melt in the hottest weather. The top is made of a board of the same thickness as the box, to which it is firmly fastened by nails or screws. The base of the hive is formed only by the pedestal or platform, like the common hives. On one of the large sides of the hives, which ought to be placed in front, an aperture is made at the bottom, exactly in the middle, of about three inches broad, and about half an inch high, to serve as an entrance to the bees. The hive being thus constructed, it is sawed exactly in the middle from the top to the bottom, in order to divide it in two equal parts. The middle having been exactly sawed through, half of the entrance ought to be found in each part. The exact division having been made, two boards of three or four lines in thickness, and a foot square, are taken, in the middle of which a square opening is made of three inches, which, if preferred may be made round. One



of these boards is attached to each half of the hive by small nails, in order to close the side of the hive, which has been left open by the act of sawing. By this means, each division of the hive, which has been sawed, assumes the shape of a small box open at the bottom, such as the hive itself exhibited before it was sawed through, with this difference, that the boards which have been joined come down only as low as the entrance; so that there remains about an inch between the platform and the board. Consequently, these two half hives being joined together, the bees have a free communication from one to the other by the opening which is left by the board below, and by that which has been made in the middle.

In order to form a complete hive of the two halves, four strong pegs are put into each division of the hive, and so driven in that they project outside about an inch and a half; two of them are placed in the lid, one in the front above the entrance, and another at the back; and on placing these pegs two inches in the edge of the boards, which without that precaution might be apt to split, particular attention must be paid that they fit exactly on each side; that is, that they should be exactly opposite to each other, in order that they be firmly tied with osier twigs. These two demi hives being united and attached to each other, form one hive as solid as it was before it was sawed through. The slight boards which were added, being set back to back, form only one wall of separation, which deprives not the bees of the facility of communication with the demi hives, because they can enter them either by the opening in the middle, in the same manner as by that which is below. As it is easy to be perceived, these hives are double, and may be easily divided or reunited. When they are kept in a united state, the two halves make but one hive. The bees have then two points of communication, one by the centre and the other underneath. Not having any idea of this trick upon them, they

pass without fear from one half to the other, when the population becomes superabundant. When they are divided, each half forms exactly an individual hive *.

THE STORIFYING HIVE OF MR. RICOUR.

Mr. Ricour, who was chief gardener to baron Poederlé at Brussels, was so obliging as to transmit to us the following description of his hive: "My new hive," he says, "is very simple, and possesses considerable advantages, as the wax and the honey can be obtained without destroying the bees. During several years, I made use of the wooden storifying hive of Mr. de Massac, but always without success. I therefore invented that, of which I now send you the description, which after several years of trial has fully answered my expectations. My hive is composed of two stories, made of straw like the common hives, covering the upper story with a board, with a heavy stone upon it, for the purpose of keeping the hive firm and steady. Each of the stories is twelve inches in diameter, by ten inches in height, the whole of which is therefore twenty inches.

In the month of May, 1838, I placed a first swarm in one story, and in the month of April, 1839, I placed a story upon it. The hive yielded me two good swarms, and I took away one of the stories, well filled with honey and wax. I have great reason to hope that my newly invented hive will yield me every year a story full of honey, independently of the swarms.

Mr. Ricour states that he never makes use of wire for the purpose of effecting the separation of the two stories, and that it is a matter of indifference from which of the two stories the honey and wax are taken.

* This is the hive so warmly recommended by Bonner, and Gelieu demanded of the minister, Cardinal de Fleury, a patent for establishing it in France. See the letter of Reaumur inserted in the Memoirs of the Society of Agriculture of Brittany, 1759, 1760. The hive of White is almost similar to that of Gelieu.

In regard to the latter point, Mr. Ricour is evidently in error, and to those who might be disposed to make use of this hive, we cannot sufficiently offer our advice, to be particularly careful not to take away that part of the story which contains the brood.

This hive of Ricour, although of extreme simplicity, is after all nothing more than the common Cottage hive, or the hive of Jean de La Caille, or the Count de la Bourdonnaye. Nevertheless, it is probable, that Mr. Ricour may not have possessed any knowledge of the merits of the above mentioned hives; and it must be acknowledged that his hive possesses with them the great disadvantage, that it is not secure from the depredations of the rats, mice, and other vermin, and that, on account of its flat top, it is difficult to protect it from the rain.

THE STORIFYING HIVE OF L'ABBÉ ELOI.

If Ricour were ignorant of the hive of Jean de la Caille, or De La Bourdonnaye, it appears to us that it must have been equally unknown to the Grand Vicar of Troyes. On a strict examination of the two hives, that of the Abbé Eloi is perhaps after all nothing more than an improvement of the common storifying hive, inasmuch as it merely consists of as many stories as the proprietor may be inclined to use. The Abbé generally uses seven, each three or four inches in height, and from twelve to thirteen inches in the clear. Every story has its individual bottom of wood, pierced with five large holes, about two inches in diameter, and with fifty or sixty small ones, each of eight or ten lines. The hive is surmounted by a board without any holes, with a stone or a brick on the top. With the exception of the number of the stories and the construction of their bases, the hives of Ricour and l'Abbé Eloi very nearly assimilate in their plans.

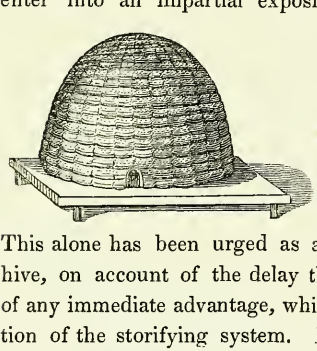
The history of this hive was inserted anonymously in the BIBLIOTHEQUE PHYSICO-ECONOMIQUE, in which it is represented with only four stories, and from that work we extract the following simple and ingenious method adopted by l'Abbé Eloi, which the peculiar construction of his hives renders so easy, of procuring some beautiful honey-comb at an early period of the season. A bowl or a glass vase is placed on the bottom of the last story. This vase must completely cover the five great holes, and the bees will very soon commence the construction of their combs in it, and fill them with honey. The vase is placed in the hive the same day as the swarm, and in a fortnight or three weeks afterwards, it may be taken away, by drawing a thick brass wire between the vase and the bottom. It must be observed the bottom on which the vase is placed should be pierced with only five large holes, or with one large one of the same diameter as the vase.

The hive of l'Abbé Eloi possesses, however, one advantage over that of Ricour, which is, that a proper choice can be made of the story, which is the most ready and fit to take, and thus a harvest can be reaped, according to the will of the proprietor. In regard to the enemies of the bees, the hive of Eloi is equally exposed to them, and, indeed, it appears to us in general, that the different inventors of hives have not paid that attention to a proper protection from the encroachments of the numerous enemies of the bees, which they so particularly require.

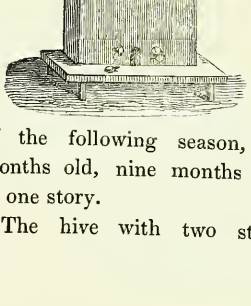
There is, perhaps, no species of hive which has undergone so many modifications, improvements, and alterations, as the storifying hive. At one time, the practice of storifying was so prevalent in France, that every other system gave way to it. Swammerdam may be considered as the father of the storifying system, and he mentions that he once possessed a colony of *thirty stories;* this might with great propriety be called the tower of Babel of the bees: but Swammerdam

omits to state the individual height of his stories, and therefore we are left to our own conjectures as to its gross elevation.

Ducouedic may be said to stand at the head of the storifiers of France, although he has met with some severe strictures from Messrs. Bosc, Feburier, Lenormand and others. We will first give a description of the hive of Mr. Ducouedic, it having been panegyrized as the most complete yet invented on the storifying system, and then enter into an impartial exposition of the system itself.

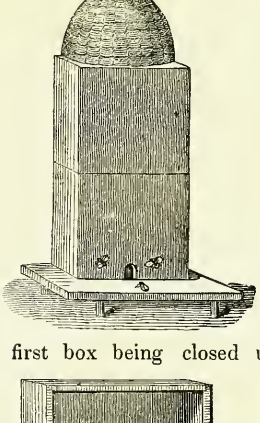


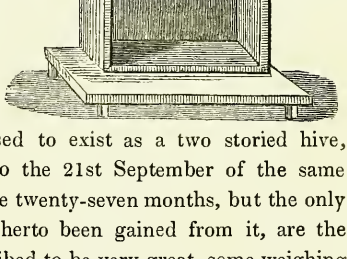
The annexed plate is the common straw hive, placed on a platform in which a first swarm is placed, and in this state it remains during the whole of the winter of the same year. This alone has been urged as a decided objection to this hive, on account of the delay that attends it in the reaping of any immediate advantage, which is the chief recommendation of the storifying system. Early in the following year, the first story is added to it, and it is then called *La Ruche Ecossaise* or Scotch hive. The hive then remains in the state of a single story for an entire year, and if the population of it be considerable, and the season favourable during its first year, it may be expected to produce two or three strong swarms. On the return of the following season, the hive will be twenty-one months old, nine months as a simple hive, and twelve as one story.



The hive with two stories is represented in the

accompanying plate and it is then known by the name of the pyramidal hive. These three hives or compartments are plastered with mortar or clay at their junction, from which they form but one individual hive, the ingress and egress of the bees being by a single aperture made in the lower story. The apertures in the straw hive and the first box being closed up, in each box or story, there is a hole made in the top of it, which serves as the channel of communication for the bees from one story to the other.





The colony is supposed to exist as a two storied hive, from the 21st March, to the 21st September of the same year. Its age will then be twenty-seven months, but the only advantage which has hitherto been gained from it, are the swarms which are described to be very great, some weighing from twelve to twenty pounds * ! ! !

The harvest of honey in this hive does not commence until it is nearly three years old, when the combs must be blackened by age, and therefore of no further use, than to be put into the press for the honey to be squeezed out.

* This is according to the calculation of Mr. Ducouedic, but it sets all credibility at defiance : 5360 bees weigh a pound, a swarm therefore of twenty pounds must contain 107,200 bees. Even a swarm of twelve pounds must contain 64,320 bees, and the whole of them the produce of one mother.

Mr. Ducouedic meets this objection by stating that the honey will be of the collecting of the current year, as the bees will have consumed that of the preceding year. We will admit that the honey may be of the present year, but the combs will be so black, as to be utterly unmarketable.

The first story of this colony is removed as soon as the drones have been murdered, and it then ceases to be a pyramidal hive, and returns to its state of the *Ruche Ecossaise,* in which state it remains during the autumn and winter, and on the return of the spring, another story is added to it, when it again takes the name of the pyramidal hive.

When the hive is in its pyramidal state, the bees never perish by hunger; it is too well provided with provisions, and its population is too numerous to be affected by the most rigorous winter. When the bees are grouped together, they maintain the necessary temperature of the hive by their reciprocal heat, and the brood on the return of the spring are always hatched one month earlier than in any other hive *.

Such are the advantages of the storifying system, as given by Mr. Ducouedic, when practised in his own hives; we will however show that those presumed advantages are in some respects, positive disadvantages, at the same time, that the many inconveniences and drawbacks with which it is accompanied are carefully concealed from the view. It is an undisputed point in the management of bees, that the hive should always be proportioned to the magnitude of the

* Referring to the too great capacity of the pyramidal hive of Mr. Ducouedic, Messrs. Bosc and Olivier, members of the Institute and the Commissioners chosen to examine that kind of hive, expressed themselves as follows in their report made to the Society of Agriculture of Paris, and to the Institute: "It is a fact that the honey becomes coloured and deteriorated in proportion as it remains in the hive, on account of the reaction of these principles in themselves; a reaction strengthened by the great heat which reigns in the hive: the honey of the present year is always the best."

swarm, but the country people are generally afflicted with the notion that the greater the hive, the greater the quantity of honey, than which nothing can be more fallacious. The labour of the bees appears to have its limit, and it is not an enlarged space which will induce them to exceed it: but the great difficulty of proportioning the hive to the size of the swarm, proceeds from the impossibility of determining the magnitude of a swarm on its first settling. The hotter the weather, the larger the swarm will appear; on the principle that the bees extend themselves to admit the air between them; and from appearance, the proprietor might be led to conclude that the swarm is a very large one; but let the coolness of the evening come on, and the bees have grouped themselves closer together, and a doubt is then actually raised, whether it can possibly be the same swarm, that was seen in the middle of the day.

The weight is certainly a criterion of the magnitude of a swarm, but even this cannot always be depended upon; for although it may appear paradoxical, yet a large swarm and a middling one will often weigh nearly the same, and this arises from the quantity of food which the bees may have brought with them from the parent hive, and also from the number of drones. A middling swarm will often have more drones than a large one, and thus the proprietor becomes deceived in the weight. There is also another circumstance to be taken into the account, which is, that all swarms will not work alike; the greater the fecundity of the queen, the greater the activity of the bees, and thus one swarm will fill a story in fifteen or twenty days, whilst another will scarcely fill it during the whole season.

A boasted advantage of the storifying system is, that the upper stories may be taken off full of honey, and by substituting empty ones at the bottom, a great benefit is obtained by the regular renewal of the combs, which is said to possess a favourable influence, both on the quantity and the

quality of the honey. In regard to the former, on account of the capacity of the cells becoming diminished by the little film in which every larva of the bee envelopes itself, and which it leaves behind it in the cell; and in regard to the latter, on account of the quantity of pollen which the bees have stored up in the combs, which imparts an unpleasant bitterness to the honey, and renders it almost unfit for domestic purposes.

The advocates for the storifying system boast, that it is highly favourable to the formation of artificial swarms; it should, however, be previously demonstrated, that any actual advantage is to be derived from an artificial swarm. It may, indeed, be easy to take away a centre story, in which it is most probable that some embryo queens may be found; but the question arises, whether by taking away that centre story, a direct and irreparable injury has not been committed to the hive, and whether, by disturbing the internal economy of the hive, the foundation of its ruin has not been laid.

With the most decided disapprobation of any system of management, which has for its basis the disjunction of the bees, we cannot but characterize the storifying system as one of the most injurious, especially if the stories be small; for the bees are obliged to live, as it were, in different families, whereas their natural instinct leads them to live in the strictest union; and it is with bees, as with other animals, that we never knew any that were diverted by artificial means from the course prescribed to them by nature, which did not ultimately degenerate and perish altogether. The health and prosperity of a hive depend in a great degree on the temperature that is maintained in it, and in proportion to the number of the bees, so is the heat of a hive. If then, by the storifying system they be divided into several clusters, the temperature cannot be so high, as if they were all collected in one body; and this very circumstance

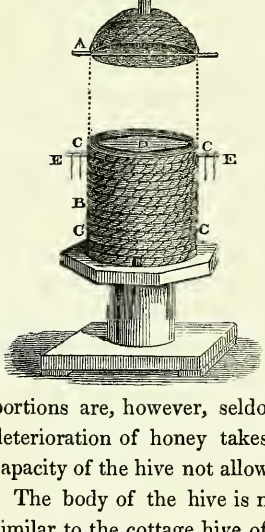
accounts for the lateness, in which a storied hive throws off its swarms, that is, if it throw any at all; for we were once in correspondence with a most strenuous advocate for the storifying system, who possessed so much candour as to admit, that he had few or no swarms from his storied hives; but then he tried to argue himself into the convenient conviction, that swarms were by no means beneficial, and ought to be prevented. He, therefore, congratulated himself that he had adopted a system, by which that advantage was so easily and decidedly obtained. By degrees, however, his eyes began to be opened to certain disadvantages connected with the storifying system, and the knowledge of some of them led him to the discovery of others, and ultimately to the renunciation of the system altogether.

One of the greatest and most serious inconveniences of the storifying system is, the transversal separation of the combs for the purpose of dividing the stories, and the evil of which is greater in summer than in winter, on account of the greater flaccidity of the combs in the former than in the latter. The stories are generally separated by means of a wire passed between them, and when the combs are in a soft and tender state, they are apt to be crushed, rather than yield to the incision of the wire. A risk is thus incurred of the combs falling upon each other, and a number of the bees, and perhaps the queen, are killed.

One of the greatest drawbacks to the storied hives is the *flatness* of the top, and this defect is even acknowledged by the staunchest advocates of the system. In the summer, the perspiration settles on the top, and thence falls in drops on the bees; and it was to obviate this evil, that Madame Vicat placed a piece of tin, bored with little holes, on the top of her boxes or stories, through which the perspiration could exude, and Schirach recommends the adoption of the same plan.

Mr. Lombard, an apiarian of no mean celebrity, was very

sensible of the disadvantages attending the storifying system; but still, under certain modifications, he was by no means opposed to it. He was, however, decidedly averse to the disunion of the bees, and therefore he contrived a species of separation, which facilitates the deprivation of the honey, but at the same time grants to the bees a perfect communication with each other.

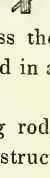


The hive is composed of two parts, the cover of the hive A, and the body of the hive B, forming together an elevation of from seventeen to twenty inches, and an uniform diameter of one foot within the clear, excepting the upper part, which should be convex. If any variation be given to the elevation, it is merely to proportionate the hives to the size of the swarms, or accordingly as the season is more or less advanced. The above proportions are, however, seldom exceeded, because a positive deterioration of honey takes place, on account of the great capacity of the hive not allowing of an annual deprivation.

The body of the hive is made of bands of straw, exactly similar to the cottage hive of this country. At the top and bottom of the body of each hive, an outward projecting band is made, C C. At the top of the body of the hive within the clear, and even with the last band, is placed a flooring D, made of a thin piece of board of ten inches in breadth

throughout, the four corners of which are sawed off in such a manner, that in measuring the board from one corner to another the measure is exactly one foot. This board is fastened with nails driven into the upper projecting band, and entering a little into the front. It is by means of the four openings left by the corners of the board being sawed off, that the bees obtain a free communication, and by which, when fumigated, they are driven from the under compartment to the upper. The effect of this board is seen as here represented, being the top of the hive viewed longitudinally. Under the board a flat rod E E crosses the hive, about fifteen or eighteen lines. It answers the purpose of lifting the hive, and facilitates the fastening of the cover, which has also a projecting rod on each side, corresponding with that of the hive.

The first two bands of the cover A should be of the same diameter as the hive, the third should decline insensibly, and so on progressively, until the cover at its elevation be about four or five inches. At the top is left an opening of about fifteen or eighteen lines, in which a dagger of the accompanying form is placed, one foot in length, and diminishing gradually in its height, which is only ten inches, the remainder being buried in the cover. In order that this dagger should not penetrate to a greater depth on account of the outer covering, a rod rather curved, six or eight inches long, is fixed, which passes across the dagger, and bears on the convexity of the cover, and in a contrary direction to that of the interior.



The base of the cover is crossed by the projecting rod, which serves to support the combs which the bees construct in the cover. The covers should be about four or five inches in depth, that they may be proportioned to the size of the swarm. Were they to be made of greater depth, some combs might be made which could not possibly be extracted.

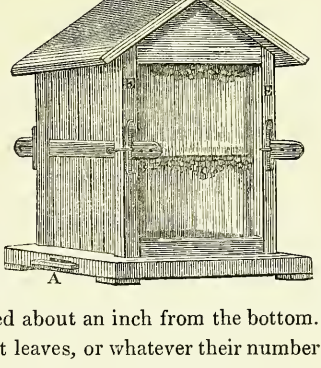
In the interior of the hive two bars are placed crossways, one above the other, for the purpose of supporting the combs. It is requisite that they should project a little, in order that they may be drawn out with pincers when the hive is deprived of its honey.

In regard to these cross-bars or sticks, we consider their use to be one of the greatest defects of the common straw hive, and even of every hive in which they are used. We further declare them to be altogether useless, for the bees attach the combs too strongly to the sides of the hive, to require the application of any other support. In all our attempts to deprive the common cottage hive of its superfluous store, we have always found these sticks to be one of the greatest impediments; in fact, they reduce the operation to almost an impossibility. The country people in general stick their hives ridiculously; for, not being content with one or two, we have frequently seen four and six, which oblige the cottager literally to mangle the combs before he can extract them. In this respect the advantage of the Huish hive will be at once apparent.

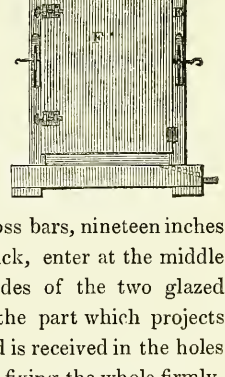
THE HIVE OF HUBER.

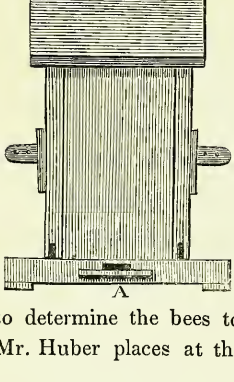
It is by means of this hive, that Huber has pretended to have witnessed all the miracles, with which his natural history of the bee is disfigured; but we have only to examine minutely its construction, to arrive at once at the conclusion, that his visual powers must have been of most wonderful formation, to enable him to see what he has so minutely and ostentatiously described.

The frames are eighteen inches in height without the clear; within they are seventeen inches; and the breadth is determined by the number of combs which it is desired to have, varying from eight to twelve, allowing one inch four lines for every comb. The accompanying figure represents

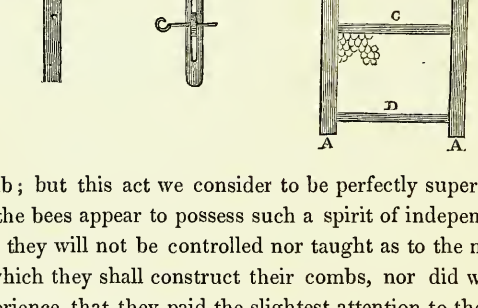


one of the frames. The uprights are eighteen inches high, and one thick, and fifteen lines broad. The upper cross bar is of the same thickness and breadth. The cross bar is ten lines broad and four lines thick and is placed at the height of six inches and a half. The lower one is square, six lines thick, and is placed about an inch from the bottom. At the two ends of the eight leaves, or whatever their number may be, there is a frame at each side; each of which is destined to receive a glass partition at the side of its interior, and at its exterior a shutter. The opening of the frame, to receive the glass partition and the shutter, is ten inches in breadth, and fifteen in height, the whole within the work. Hinges are affixed, that they may be opened and shut at pleasure. The leaves are made of deal, with the exception of the two outer ones, which are made of oak or walnut wood. The leaves are united only on one side by the hinges; for were it to be constructed otherwise, the risk would be run of crushing the bees in shutting the frames. In lieu of the hinges, two cross bars, nineteen inches long, fifteen lines broad, and four thick, enter at the middle of the height, and from the two sides of the two glazed frames, a small iron pin is put into the part which projects along the side of the eight leaves, and is received in the holes regularly bored; and with the view of fixing the whole firmly, there are four wooden pegs, or wedges, sloping gradually





to the end. They are driven under the iron pin, which they close upon until the whole be solidly united. The entrances of the bees, which are at the bottom of the leaves in the great front, are reduced to a single one A, at the bottom of one of the little sides, cut out of the thickness of the foundation board, with a small projecting plank for the bees to alight upon. In order to determine the bees to work on the plane of each leaf, Mr. Huber places at the top of each leaf a small piece of



comb; but this act we consider to be perfectly superfluous, for the bees appear to possess such a spirit of independence, that they will not be controlled nor taught as to the manner in which they shall construct their combs, nor did we ever experience that they paid the slightest attention to the comb which has been presented to them as a guide.

Mr. Huber adds to his hive a covering composed of three pieces, two of which are placed on the side of the cross bars, and the third in the manner of a roof, which rests on those two pieces, and is intended for those hives that are exposed to the open air.

THE HIVE OF HUBER MODIFIED BY MR. FEBURIER.

"For the construction of this hive," says Mr. Feburier, in his excellent *Traité sur les Abeilles*, "I took some pieces of deal about an inch broad, and fifteen lines thick throughout the whole length of the outward surface. I made a groove six lines in breadth to nine in depth. I then adjusted some other pieces of wood of six lines broad and nine thick in such a manner, that one of those pieces fitted in exactly into the groove. I then joined an upright of fifteen lines in thickness with one of nine, by means of two cross pieces, one in the top and the other in the bottom, leaving four lines' distance between them, and of them I made a sash or window frame of twenty-two lines broad, to a height determined according to the proportions of the hive. This sash, when set up, presents in the front to the left the groove of six lines broad to nine deep, and behind to the right, a space of six lines to nine in thickness. In the midst there is an opening of four lines broad from one cross bar to the other, with a small groove in which to receive the pane of glass.

"After having made sixteen small frames, eight of which were two inches longer on account of the slope of the lid, I joined them two by two together by means of some pieces of wood of six inches long, arranged like the first, taking care to nail together the uprights and the cross bars of the same dimensions. These cross bars being firmly nailed, and forming within a space of six inches, I preserved the space at the bottom by means of some round pegs, placed at a third of the height, and crossing the thickness of the uprights, and supported by a small wooden wedge.

"This operation being finished, I had eight frames without bottoms, having one side to project to fill up the space of the groove formed by the opposite side. On joining all these frames together, I fastened them one to another, and

the projection being six lines, reduced the breadth of each frame to six lines. I made two other frames, which are applied to the sides, giving them the same thickness, and two inches in breadth, and I filled the space by a pane of glass placed within. By these means I had all the advantages of the hive of Huber, as well as those of the mirror hive, which has but one comb."

Notwithstanding all the advantages which this hive apparently possesses, the inspection of the interior of it is not so easy as with the common mirror hive; nevertheless, the latter possesses many defects, which depreciate it in the estimation of the naturalist. It is very difficult to introduce a swarm into it, and it is seldom accomplished without a great deal of trouble, even with the most skilful management. With Huber's hive, the introduction of the swarm is as easy as in the common cottage hive; but the chief benefit of the Huber hive consists in the regular formation of the combs on the cross bars of the frames; but as this is a contingency dependent on the mere caprice of the bees, the value of the hive becomes in consequence greatly deteriorated.

THE OPEN HIVE OF MESSRS. MARTIN OF CORBEIL.

This hive may be considered in its general principles as one of the most extraordinary, that ever was put into use, inasmuch as it is opposed to those general modes of practice, which have universally been considered as the basis and the proof of good management. The maintenance of a particular degree of temperature has always been considered as highly conducive to the welfare of the hive; as it promotes the early deposition of the eggs by the queen, and a general incentive to activity and industry on the part of the bees. In this hive, however, the bees, with all their works being exposed to the open air, every possible degree of temperature is

experienced by them, from the scorching heat of a summer day, to the rigorous cold of a wintry one. In one sense, however, it possesses an advantage superior to any other hive, which is, the extreme facility that it grants of inspecting the operations of the bees under every possible circumstance; and consequently, we are entitled to draw the conclusion, that the Messrs. Martin would have been able, on account of the peculiar construction of their hive, to have verified some, if not all, of the astounding discoveries of Huber. Being in regular correspondence with Mr. A. Martin, we suggested to him the benefit which he would confer upon naturalists in general, and particularly the entomologists, if he would devote his skill and time to the verification of the discoveries of Huber, and particularly to the marvellous events, which Huber has witnessed on the birth of a queen. Mr. A. Martin, like ourselves, is a confirmed, and, if possible, a more inveterate infidel regarding the much vaunted discoveries of Huber; but nevertheless, truth being our sole object, the whole series of Huber's experiments were gone through, and we have the authority of Mr. A. Martin for the assertion, that *in not one single instance* did he verify any of the observations of Huber; in fact, he styles them, *les supercheries d'une tête insensée,* which we will translate "the subtle frauds of a deranged brain."

The construction of the hive is in itself very simple, being divided into four moveable parts, placed one above the other. Each of these parts is styled *a case,* and each case is formed of two shelves of well seasoned wood, three lines thick and eleven superficial inches square. Every shelf has in the middle a hole, sixteen lines square. These two shelves are united by four wooden pillars, five lines in diameter, and three inches eight lines high, fixed between the two shelves at equal distances, and at thirty-two lines from the edges of each point; each end of

the pillars is fastened by a nail. The whole constitutes one case.

Four of these cases are placed one above another, in order to form an ordinary hive. The holes ought to correspond perfectly with each other, closing that one wholly which is at the upper part of the hive, but still in such a manner that it may be opened or closed at pleasure. The whole of the construction is supported by means of two iron rods placed crossways under the lower case, and joined and fastened to the upper case.

The whole being thus arranged, it is covered over with a piece of cloth or linen, leaving open one of the fronts of the lower case. It is by that channel, that the swarm is introduced, after which it is wholly closed up, leaving a small aperture for the ingress and egress of the bees.

The swarm being introduced, proceeds in its usual way, and commences to lay the foundation of its combs. The lateral sides of this hive not offering them any security, the bees do not commence their labours in that quarter, but in the very centre of the case; they then pass into the second, then into the third, and finally into the last. In a favourable season, the whole of this is accomplished in eight or ten days; the cloth may then be wholly removed, which will stick but slightly to the combs; indeed it might be removed at the expiration of a few days, but then the risk would be run of having the bees all on one side, which would be the means of rendering the work irregular and unseemly. But if, according to the advice of Messrs. Martin, the cloth be not removed until the cases be nearly all full, the hive will exhibit a regular work, which will be continued in the same order.

Thus exposed to the open air, the bees will tranquilly continue their labours, if the atmosphere be always calm, and exempt from everything which might prove essentially prejudicial to the bees; for it must be borne in mind that

although the hive bears the denomination of the open hive, still it must not be exposed to the intemperance of the seasons; the bees would certainly not be able to resist either the ardour of the sun of some summers or the frost of some winters, nor even the ruinous effects of tempests and of rain. The same precautions should therefore be adopted as with other hives, to protect them from those inconveniences, and they should be supplied with a covering.

The hives should be immediately placed on a platform or pedestal about two feet broad, but they ought not to rest immediately on the board, but on four pieces of wood, which will raise them about twenty-four lines from the level of the platform. One great advantage is derived from not multiplying the number of the supports, as the facility is thereby obtained of clearing away the insects which habitually harbour amongst those places.

According to this statement, a hive of this kind is very easy to make, and attended with very little expense. There are few persons who possess not skill enough to make one in the course of a few hours. The state of the bees may be ascertained by simply lifting the cloth, and many of those inconveniences thereby removed, which are attended with so much difficulty in the majority of hives.

We can only add, that this hive will never become popular, and we question whether it would ever succeed in the uncertain climate of this country: it may indeed be said in opposition to that statement, that bees have been known to work in the hollows of trees in this country for two or three years, where they have been exposed to all the vicissitudes of the weather; but the entire exposure of the bees in the hive of Messrs. Martin is a positive drawback to its general adoption.

THE HIVE IN PORTIONS OR FRAGMENTS, BY M. BEVILLE.

This hive is described in the following manner by the inventor, in his *Traité de l'Education des Abeilles.*

From the manner in which my hives are constructed, says Mr. Beville, I possess the power of enlarging or diminishing the habitation of my bees, and it is one of those great advantages in the management of bees, of which Palteau was the inventor.

Palteau, however, who wrote in 1756, made his hives exclusively of wood, with wooden coverings. I have made them of wood, and according to all shapes, and generally speaking, I may say, that the bees prospered in the wooden hives; but it is not every one who can bear the expense of wooden hives, and especially when those made of straw are equally good, if not better.

Mons. Boisjugan wrote a treatise in 1771 on bees and hives made of straw, which possesses considerable merit; he, however, divided his hive only into three portions, whereas I follow the example of Palteau, and divide it into six.

The chief art in the construction of a hive, is to proportion the size of the habitation to the magnitude of the swarm; for the great inconvenience attending the common hives is the incapability of augmenting or diminishing the habitation of the bees. If the hive be too great, there is no resource left, and the swarm is often lost on account of its habitation being too spacious. The bees waste their time in making the combs wherewith to fill the hive, and neglect the collecting of their provisions for the winter use.

The habitation of the bees should also be proportioned to the season in which the swarms are produced. The swarms, which are thrown off from the 20th of May to the 20th of June, ought to have a more spacious lodging, than those which are thrown off subsequently. The second swarms

ought to be lodged in a smaller hive than the first, and the third in hives still less, unless two or three be united.

The swarm ought in general to fill a moiety of the hive on the evening on which it has been hived. Thus if the swarm fills but one portion or fragment, two only will be required; if it fill two, four or five, or even more will be required for the early swarms, and three or four at most for the late ones, because it then requires the hive to be more than half filled with bees, they having less time in which to work. Independently of which, there is no risk in putting rather a smaller than a larger number; because, if required, the addition can be so easily made, and at all seasons.

I make, therefore, the portions or fragments of my hives of either white deal, osier, privet, or straw, from three inches to three inches and a half in height, to ten or eleven inches or a foot in diameter. I give the preference to eleven inches within the clear, and three inches six lines in height.

Five of these portions, a foot in diameter for the strong early swarms, will make an excellent hive. Some may be made of smaller dimensions, say ten inches for the late swarms which are thrown off after the 20th of June, or for the second swarms.

It would be advisable not to make the hive at the moment of the hiving of the swarms of more than four portions or fragments, and the fifth should not be added until the month of April, or the commencement of April of the following year, supposing that the swarm be not very strong, in which case it may be added in July. According to this system, the hive is formed by degrees, and in proportion as the population increases.

It is perfectly indifferent as to the shape in which these portions or fragments are made, whether square or round; to the bee itself the shape is indifferent, the great object is cleanliness, which is one of the greatest virtues in the management of bees.

In every portion or fragment of the hive, a kind of flooring of open work is placed, composed of five or six rods at the top of each fragment, and when the different portions are arranged one above the other, the open work is placed in an opposite direction, so as to form a certain number of squares.

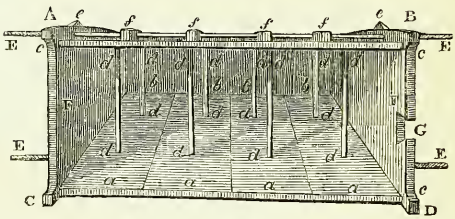
In the upper fragment, forming the top or head, is the open work flooring, which facilitates the first operations of the bees; to it they attach their first works, which are successively supported by the transverse rods of each fragment forming that kind of open work flooring. It is advisable to place these rods at about six lines from the upper part of each fragment of the hive.

The collection of honey from these hives is very simple, as by means of a little smoke, the bees can be driven from the upper fragments, in which the best honey is stored, when the whole of the fragment can be taken away, and replaced at pleasure.

THE HIVE OF MADAME VICAT.

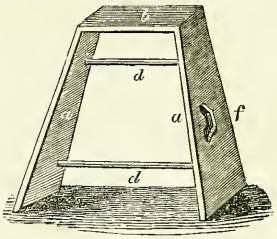
Madame Vicat, a native of Switzerland, was a strenuous advocate for the storifying system; but she entertained considerable objections to the perpendicular method, and therefore invented a hive formed of collateral boxes, which certainly possesses many advantages in which the perpendicular system is wholly deficient. At the same time, we cannot award to Madame Vicat the meed of entire originality, as her hive is but a modification of that of the Abbé della Rocca.

Fig. 1.



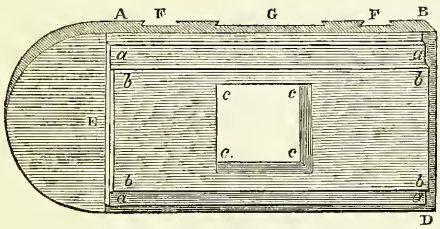
A B C D represent the interior of the hive, composed of four boxes or compartments fixed together; laid on their sides *a a a a* E E are rods with screws by which the boxes of the hive are connected; F F represent the front and back of the hive; *b b* are the bottoms of the boxes seen in the interior, but more properly the tops as they stand in the hive; *c c c c* are notches which serve to fasten the hive to the ledge of the table; *d d* are the rods destined to support the combs; these rods are eight in number, two to each box which they cross longitudinally; *e e* are two screw nuts moveable along the rods E E, and which serve to fasten the boxes more or less closely to each other; *f f f f* are the wooden rings through which the same rods pass.

Fig. 2.



The accompanying figure represents one of the boxes separated from the hive, showing the same parts marked with the same letters as in the preceding figure; namely *a a* the sides, *b* the bottom, *d d* the rods, and *f* the ring of the box. F represents the table of the hive as seen from above A B C D; E is the fore part of this table;

Fig. 3.

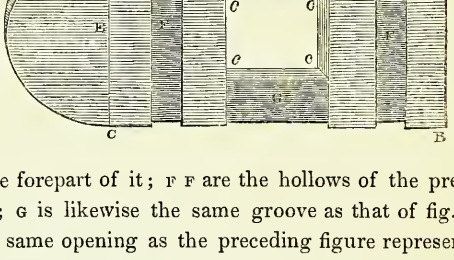


F F are hollows made in the under side of the table to receive

the legs which are nailed to it; G a groove to receive the slider of the table represented in fig. 5; *b b b b* are ledges which enter into the notches *c c* of fig. 1; *a a a a* are ledges which fix the covers represented in fig. 7; *c c c c* is the opening made in the table of the hive in order to its being examined and cleaned by means of the drawer fig. 5.

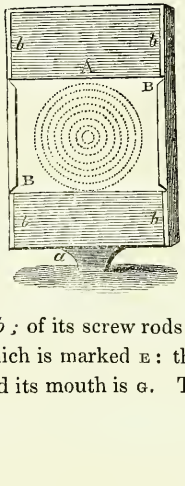
Fig. 4, represents the under surface of the table A B C D;

Fig. 4.



E is the forepart of it; F F are the hollows of the preceding figure; G is likewise the same groove as that of fig. 3 and *c c* the same opening as the preceding figure represents.

Fig. 5.

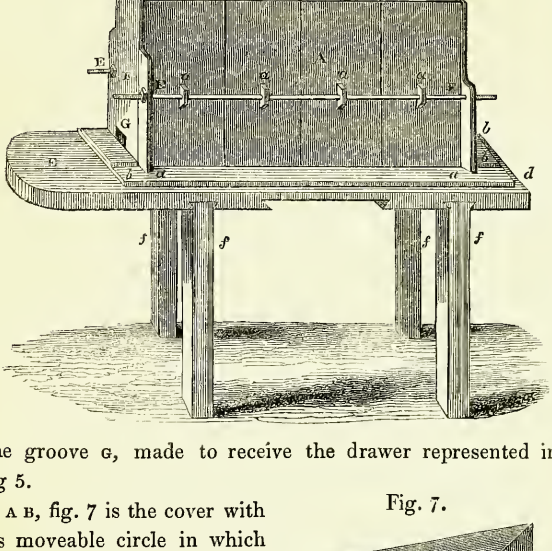


A, fig. 5, represents the drawer of the table; B B is a linen slider intended to let air in at the bottom of the hive; *a* is the handle of the drawer; *b b* are the ledges which serve to secure it in the groove, c of fig. 3 and 4.

The accompanying figure represents the entire hive composed of its four boxes, *a a a a*, *b b b b*; of its screw rods F F; of its table *a b c d*, the fore part of which is marked E: the fore part of the hive is marked F, and its mouth is G. The ledges of the table are marked

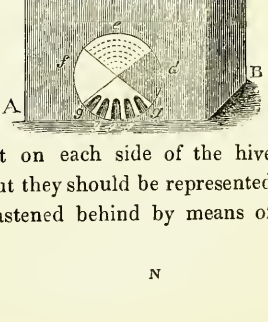
with the same letters, *a a b b*, as in the foregoing figures, and the feet *f f* are nailed in the notches on each side of

Fig. 6.



the groove G, made to receive the drawer represented in fig 5.

Fig. 7.



A B, fig. 7 is the cover with its moveable circle in which the part *e* is pierced with holes; *f* is quite open; *g g g g g* are five little arched openings for the passage of the bees; and *d* is the close part to shut entirely the openings G, when the weather is too cold for the bees. The screw rods should not be made to project on each side of the hive so much as they do in fig. 1; but they should be represented as in fig 6, where they are fastened behind by means of an iron rod.

When a swarm is put into one of these hives, the upper piece, or top of one of the boxes is taken off, and the straw hive is placed upon the opening; putting a grate of wire in the hole to prevent a union of the combs in the box with those in the hive, which would render the separation more difficult.

When a box is to be taken away, the rod which holds the boxes firmly connected is unscrewed. The boxes which are to remain untouched may be secured by staples. The opening in the bottom of the piece of deal, which forms the back part of the hive, is then to be opened, and the smoke of linen rags is blown into the box; as soon as it is conceived that the bees are by these means driven out of the furthest box, the end is loosened and taken away; then the box itself is detached from the next, and the combs, if they run in a longitudinal direction, must be cut through with a wire or a sharp thin knife; if the combs run cross-wise, they must be taken out singly before the box is taken away. The box being then removed, the piece of deal forming the back of the hive is immediately joined to the remaining box, and secured as it was before. The smoke should be kept up all the time to prevent interruption from the bees. If the first box is to be taken away, the same steps are to be exactly pursued; and if it be done when most of the bees are abroad, scarcely a bee will be lost.

Having now described the hives which are chiefly in use on the continent, we shall proceed to a description of those which have been invented in this country; although we premise, that we cannot pass a high eulogium on their merits. There is very little originality in their invention, they being chiefly modifications of other hives, preserving all their defects, and wholly losing sight of their good qualities.

In regard to the glass or bell hives, they are fit only for the amateur, although they have been recommended by some

fanciful apiarians as an excellent invention for discovering the internal economy of the bee. We, however, are decidedly of opinion, that not a single discovery has ever been made by means of the glass hive, and so far from being conducive to the prosperity and health of the bees, they act in a directly opposite ratio; we can therefore only recommend them to those persons, who wish to have a little fine honey at the close of the season, but, who are not very anxious for the preservation of their bees for the operations of the succeeding one.

THE MIRROR OR EXPERIMENTAL HIVE.

It is to this hive that we are indebted for many of the discoveries of Huber and Dunbar, especially of the latter naturalist; for in regard to the former, it appeared to be to him a matter of perfect indifference in what hive his experiments were carried on, for the results were always in perfect unison with his anticipations.

The mirror hive is made from a foot and a half to two feet in height, and to one foot or a foot and a half in breadth. The uprights of which it is formed ought to be two inches thick, and eighteen lines broad. This breadth, which is sufficient for the bees to construct one comb, forms almost the whole interior of the hive. The lower part of the frame is moveable; to each side of this frame, another frame is affixed, of the same proportions, with the exception of the thickness, which ought only to be six lines. As the first frame is two inches in thickness, it is necessary that the frame of the other should be two inches broader. A groove is made in the inside of these two frames, in which to affix a glass, over which the frame projects about one line, for the purpose of applying the pulley, and the sprigs necessary for fastening the glass. This border augments the capacity of the hive by two lines; thus it is made of twenty lines, twelve for the combs, and eight for the passages before and behind the comb. These proportions ought to be exact; but it

would be more advisable to reduce them a line than to augment them, because the bees would then work against the glass.

The frames are attached on one side with hinges, and on the other with hooks, or with some iron-wire.

An entrance is formed for the bees, by making a slit in the lower part of the frames, an inch and a half broad to about six in height. This slit ought to be sloping in the middle of the frame; the glass not being covered by this slit, there is necessarily an opening both before and behind. They are closed at pleasure, by the doors, which run in grooves in the frames of the sides, and which are applied directly against the glass.

Huber speaking of this hive says, "By it the queen bee can be followed in all her motions, and even in the deposition of her eggs; because the bees become in time accustomed to the opening and shutting of the shutters, and stop no longer in their works when they are observed. The queen bee may be easily caught; either in the hive, or in the passage, and thereby be prevented from going out. Food can be easily administered to the bees, and they may be kept prisoners at pleasure; they may be forced *to make wax with honey*, and *honey with sugar*; in fact all the experiments can be verified which I have so often tried with success, their results confirmed, and a guide presented to new discoveries."

In this recommendation of the mirror hive, we trace all the wild wanderings of Huber's fancy. The assertion that the bees will be so accustomed to the introduction of light and to the gaze of the naturalist, as to prosecute their labours, has not the slightest truth for its foundation, and further to affirm that the deposition of the eggs by the queen can be witnessed, can only be credited by those, who have taken up Huber's work on bees to beguile a vacant hour, but never by those, who possess the slightest knowledge of the internal economy of the hive, or the natural habit of the

bee. Astonishing and most marvellous indeed would be the benefit of the mirror hive if, as Huber asserts, it could force the bees to make wax of honey, and honey of sugar; being two acts, which bees never yet performed; but which in defiance of all truth, have been disseminated by Huber as verified by himself, and proper to be received into the natural history of the Bee, as one of his indisputable facts.

THE HIVE OF WHITE.

The Reverend Mr. White, of Holton in Suffolk, has contributed much to improve the storifying system. For the construction of his hive, he gives the following directions. It may be made of deal or any well seasoned boards, which are not apt to warp or crack. The thickness of these boards should be nearly one inch, the shape of the box square, and its height and breadth nine inches and five-eighths * every way, measuring within. With these dimensions, the hive will contain nearly a peck and a half of bees. A door must be cut in the front part of it, in the middle of the bottom edge, three inches wide, and nearly half an inch in depth, which will give free egress and ingress to the bees, and yet not sufficiently large to admit the entrance of a mouse. A hole must be cut in the back part of it, with a rabbet in it, in which a pane of glass must be fixed about five inches high and three broad, and fastened with putty. The top of the glass must be placed as high as the roof within-side, where the bees mostly congregate with their stores. By these means, a more correct judgment can be formed of their state and strength, than if the glass were fixed in the middle. The glass must be covered with another piece of board by way of shutter, which may be made to hang by

* A certain baronet, celebrated for his scientific pursuits, wishing to be rather severe upon the worthy clergyman for the extreme minuteness in his admeasurements, wrote to him to know if six-eighths would not do as well as five-eighths; the minister answered, that it only required perhaps one-eighth to make him a perfect fool, and he was most welcome to it.

a string or turn upon a pivot, or slide sideways between the two mouldings.

The side of the box which is to be joined to another box of the same form and dimensions, as it will not be exposed to the external air, may be made of a piece of split deal, about half an inch thick; this is called the side of communication, because it is not to be wholly enclosed; a space must be left at the bottom the whole breadth of the box, and a little more than an inch in height, and a hole or passage is to be made at the top three inches long, and more than half an inch wide; through these, the bees are to have a communication from one box to the other. The lower communication being on the floor, the bees with their burdens can readily and easily ascend into either of the boxes; the upper communication is only intended as a passage between the boxes, resembling the little holes or narrow passes, which may be observed in the combs formed by the bees, to save time and shorten the way; when they have occasion to pass from one comb to another, just as in populous cities there are narrow lanes and alleys passing transversely from one large street to another *.

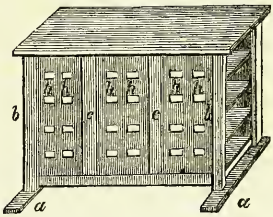
In the next place, a loose board must be provided half an inch thick, and large enough to cover the side, where the communications have been made. Several small iron staples must be kept in readiness an inch and a half long, with two points or ends bent down more than half an inch.

It is not necessary to give any directions for making the other box, which must be of the same form and dimensions. The two boxes possess only this difference, that the side of communication of the one must be on the right hand, and the other on the left. This hive and that of Gelieu nearly

* These passages or alleys through the combs, are but a fanciful conceit of the reverend gentleman. A bee always perfects its comb from the top to the bottom, without leaving any cavity or open place, unless some obstruction presents itseif. The bees are by far too good economists to waste the space in their hive, by making narrow lanes and alleys through their combs, nor did the circumstance itself ever come under our experience.

assimilate in their principles, and in point of utility they stand nearly upon a par.

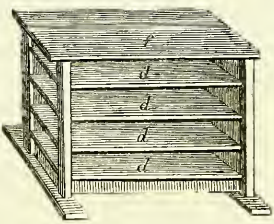
The annexed figure is the representation of the front of a frame for twelve colonies, *a a* are two sills of oak lying flat on the ground, more than four feet long. In these sills four oaken posts are to be fixed.



The two posts *b b* in the front are about six feet two inches above the sills, the other two standing backwards five feet eight inches.

Some boards of split deal must be next nailed horizontally from one of the fore posts to the other, to screen the bees from the sun. These boards must be seven feet seven inches in length, and nailed to the inside of the posts, and be well seasoned that they may not shrink or gape in the joints; *c c* are two splints of deal to keep the boards even, and strengthen them.

The annexed figure represents the back of the frame, *d d d d* are four strong boards of the same length with the frame, on which the boxes are to be placed. The upper side of them must be very smooth and even, in order that the boxes may stand true upon them, or it may be still more advisable to place under every pair of boxes a smooth thin board as long as the boxes, and about a quarter of an inch wider. The bees will soon fasten the boxes to this board in such a manner, that the boxes and the board may be moved together without breaking the combs, which for very obvious reasons ought to be avoided. These floors must be



supported by pieces of wood or bearers *e e* which are nailed from post to post at each end. They are likewise to be well nailed to the frame to keep them from sinking with the weight of the boxes: *f* represents the roof which projects backwards about seven or eight inches beyond the boxes, to shelter them from the rain.

Niches or holes must be cut in the frame over against each mouth or entrance into the boxes, at *h h. h h. h h.* in the preceding figure. These niches must be four inches long, and under each a small piece of wood must be nailed for the bees to alight upon.

The morning or evening sun will shine upon one or both ends of the frame, let its aspect be what it will; but it may be prevented from overheating the boxes by a loose board set up between the posts, and fastened on by two or three pegs.

THE HIVE OF SIR CHARLES WHITWORTH.

This hive may be considered in some respects as a modification of the pyramidal hive of Ducouedic, but that which is frequently called an improvement turns out to be the very reverse. The hive of Sir Charles Whitworth is placed on a platform fixed on a pedestal which is driven into the ground, and of a strength sufficient to bear the weight of the platform and the hive. This pedestal is driven in with such force, that the most violent winds cannot overthrow it. The upper part of it is raised only about two feet from the level of the ground.

The platform is about two feet square, diagonally measured, and two inches thick. Under the platform, and exactly in the middle, is a square excavation, in which the pedestal is inserted.

On this platform the hive is placed, of an octagonal form, being one foot eight inches in diameter, and ten inches high, with four windows of clear glass, and protected by four outside shutters, which may be opened or shut, accordingly as the works of the bees are to be inspected.

These four windows correspond with the four corners of the platform, leaving between them an open space, to which some brass handles are attached on the outside, wherewith to lift the hive when required. In the middle of the cover of the hexagonal hive, there is a square hole, which opens and shuts by means of a wooden slide, of about four inches broad, which moves between two grooves made in the thickness itself of the lid of the hexagonal hive. This square hole serves as a passage to the bees, when they pass from the wooden hive into the straw one which is placed above. This takes place when a swarm is about to depart.

Above the hexagonal hive is a hive of straw of a circular form, and rather flatter on the top than the common hives are generally made. The straw hive has a square opening in the upper part, which is opened and shut by a slide, like that which forms the communication between this hive and that which is beneath. It is by this square hole that the bees pass from the straw hive into a third, which is of glass.

Over the straw hive is placed a glass hive, the form of which is rather spherical. It has a small opening in the top, in which is placed a handle or a large brass ring, whereby to lift it when the honey is to be taken away from it.

This glass hive is ten inches and a half high, and eight inches and a half in diameter towards the base. In the middle of it is placed, in a perpendicular position, a small round piece of wood like a little cylinder, about an inch in diameter, in and directly under the brass handle. This piece of wood is crossed by another in the middle of the same form, which ought to be perfectly horizontal, and touch as it were the sides of the hive *.

* We have in a previous part of this work entered our protest against the use of these sticks, but in no kind of hive ought they to be more thoroughly rejected than in the glass hive. They cannot be regarded in any other character than as a direct nuisance in it, disfiguring the beauty of the combs, as they cannot be extracted without being cut, and thereby wasting a considerable quantity of the honey.

The slide or valve made in the upper part of the straw hive is made of either brass or tin, and is about eleven inches long, and four broad. The wooden slide, which closes the hexagonal hive, is ten inches long, four inches broad, and nine thick.

When the hive is on the point of swarming, one of these slides is withdrawn to give a passage to the new swarm into the upper hive, an advantage which the bees seize upon immediately, instead of leaving the parent hive, which is most generally the case. When it is perceived that the old bees and the new swarm are tranquil in their hive, the communication is closed, by pushing forward the slider.

At the bottom of every hive, a small opening must be made of three inches long, and three lines broad, by which the bees may enter their respective dwellings.

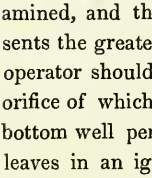
This hive in all its properties and construction is nothing more than the hive of Thorley, and therefore little or no credit is due to Sir Charles Whitworth for his alleged invention. The annexed drawing is an exact representation of the hive of Thorley, which corresponds in every particular with the description which we have given of Sir Charles' hive.

In regard to the hives of Saul, Nutt, and Bagster, they are only to be regarded in the light of toys, and the making of which is attended with so much expense, as to render them the mere objects of amusement to the affluent apiarian. The hive of Nutt with its thermometer may amuse for

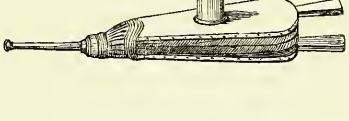
a moment the loungers in the National Gallery of Science, but its general introduction is wholly out of the question.

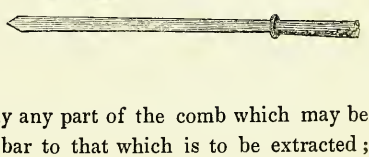
With the knowledge of the many defects and disadvantages exhibited by the various hives now in use, we considered it possible to construct one on those principles, which, would obviate those disadvantages, and at the same time combine beauty with utility. Of all the materials which have been used for the making of hives, the conviction is strongly impressed upon us, that straw is by far the best. It is clean, wholesome, dry, impervious to the effects of the weather; which are advantages not to be gained by wood or any other material. Being a warm advocate for the deprivation of a hive, in preference to the massacre of the bees, the particular shape of the hive became a matter of the first consideration, and secondly, so to construct it that the use of the sticks could be entirely abolished. In some parts of Greece, the hives resemble exactly a large flower pot; and we considered that the shape offered to us every advantage which we were desirous of obtaining. The combs being begun at the top would necessarily be larger than at the bottom, and thus, acting upon the principles of the wedge, they would be prevented from falling down, and the extraction of them from the top would, in comparison from the bottom, be a matter of great facility. In order, however, to effect the extraction of the combs from the top, it was evident that that advantage could not be gained, were the top of the hive to be of one piece, for as such it could not be lifted, without moving the whole mass of the combs, which in the first place would be next to an impossibility, and in the second, would tend to the utter ruin of the hive. Having therefore constructed a hive of the shape

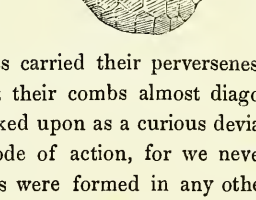
of a flower-pot, making the diameter of the base not much smaller than that of the top, we placed a projecting band at the top, on which we placed seven bars, according to the annexed figure. These bars are fastened to the band of straw by small wooden pegs, which are easily drawn out, when a honey comb is to be extracted. With the knowledge that bees will not construct their combs on an insecure foundation, we place a piece of network over the bars, of which the meshes are of a middling size, by which we in a degree force the bees to attach their combs to the bars, and thereby render their extraction more easy. Over the network, we place a board of five divisions, attached to each other by hinges; so that any part of the interior of the hive can be examined without exposing the whole. It is evident that the network is a great annoyance to the bees, for in scarcely a single instance did we not find that the greater portion of it had been nibbled away. In this lapping board we make nine holes, over which we put plates of tin well perforated, in order that the perspiration may escape, which prevents the combs assuming that black appearance, which is in general so great an eyesore to a professed apiarian. According to this construction, the deprivation of the hive is very easily effected, and it may be accomplished by the most timid person. The hive being covered with a top according to the annexed figure, it is taken off, and one of the side flaps being lifted up, the position of the comb immediately exhibits itself. If it has not been constructed exactly parallel with the bar, the opposite side may be examined, and that comb selected for extraction which presents the greatest facility. It is, however, necessary that the operator should have in readiness a pair of bellows, to the orifice of which is attached a small tin box with the lid and bottom well perforated, into which some old rags or dried leaves in an ignited state must be placed, and thus being



provided with the object most dreaded by the bees, namely smoke, as soon as the flap is opened, and the bees present themselves, they can be driven away; and should they show any disposition to return, the repetition of the smoke will curb in them all future inclination to annoy the operator. To facilitate the extraction of the combs, two knives should be ready at hand; one long, for the purpose of detaching the combs from the side of the hive; and the other for cutting away any part of the comb which may be attached to the next bar to that which is to be extracted; for although our object is in a great degree obtained by forcing the bees to work on the bars, yet we will not presume to say, that we have so far succeeded as to confine the combs exactly to one bar; nay, in one or two instances, the bees carried their perverseness to that extreme, as to construct their combs almost diagonally; but this in itself we looked upon as a curious deviation from their accustomed mode of action, for we never yet experienced that the combs were formed in any other direction than parallel with the entrance of the hive.







It is curious to observe the comments which have been made by several apiarians respecting the use and advantages of this hive; and although Dr. Bevan and others admit the

principle of it to be good, yet a great doubt exists as to its being brought into general use. Now in our opinion not the least doubt exists on the subject; for were even not only the theory but the practice of it indisputable, we are too thoroughly acquainted with the contracted notions and prejudices of the majority of bee-keepers, to suppose that they will easily adopt any improvement in the management of their bees, which has a tendency to the eradication of those prejudices. One of the chief objections which has been raised to the use of this hive is, that it is impossible to force the bees to work on the bars; and Dr. Bevan goes so far as to say, that he never saw an instance in which the combs did not either cross the bars at right angles, or connect themselves in some way or other with two or three bars, so as to render it impracticable to remove a comb or two from the outsides, in the manner that Mr. Huish proposes. In answer to these remarks of Dr. Bevan, we may venture to affirm that the experience of the learned doctor in the use of our hive must have been very limited indeed. Independently of the falsity of the statement that he has seen the combs cross each other at right angles, does not Dr. Bevan know that the combs are invariably made parallel with the entrance? and we defy him to adduce a single instance, in which the combs of a hive were ever constructed so as to form a right angle with the entrance. The great difficulty which has to be surmounted in forcing the bees to attach their combs parallel with the bars, arises from the circumstance that the side combs, which are always the richest in honey, are in general double the width of the middle combs, which are applied solely to the purposes of breeding. The machinery of a hive generally consists of seven combs, that is, supposing the bees to be in the common cottage hive; and consequently, we gave seven bars to our hive: but were we to have made the side bars of that width, which would be required for one of the side combs, we should have been

obliged to reduce the remaining bars to such a narrow compass, that even the brood combs could not be attached to them. In regard to Dr. Bevan's objection, that the difficulty in extracting the combs appears in some cases to be insurmountable, we can only say, that we never knew a single case in which the difficulty was so great, that we could not surmount it, and in regard to the excessive courage, which is said to be required in the extraction of the combs, we will put a question to Dr. Bevan; from what hive can the extraction of the combs be effected without a certain degree of courage? But this superior degree of courage sinks after all into nothing; for as soon as the flaps of the upper board are opened, and the fumigating bellows applied, the only properties then to ensure success are coolness and skill. If the bees presume to show themselves, when the operation is going on, give them a good dose of smoke, and you will see no more of them.

The late Mr. Bagster, in his work on the management of bees, devotes a whole chapter to a description of our hive; but some of his remarks lead us to believe, that he knew little or nothing of the merits of the hive from actual experience. He commences his eulogiums on the hive, by the following statement. "We conceive Mr. Huish's hive to be only *experimental*, suited to those who wish to prove what it is to be thoroughly stung, wherever the bees can find a piece of exposed flesh;"—and let us then inquire, where a hive is to be found, in the management of which the bees will not sting, whenever they can find an opportunity? Independently of which, a charge of this nature comes with a very bad grace from an individual, who professes publicly to have invented a hive which he denominates the Safety Hive; but which is a direct misnomer, for we will venture to affirm that the ladies, for whose particular use the hive was invented, will find themselves, in all their operations with it, most luxuriantly stung, unless they take the precaution to cover every part of their body. Ladies in general

are but very sorry apiarians, and their very mode of dress exposes them to danger, from which the male sex are exempt. We once paid a visit to a lady, residing at West Hill near Wandsworth, who was a real enthusiast in the management of an apiary; and being present at a particular operation that we were performing on one of her hives, she had, with the view of witnessing the whole of the proceedings, carefully covered her face and arms, considering that she had thereby rendered herself invulnerable to the stings of the infuriated insects. The operation was nearly completed, when on a sudden, our fair assistant threw down the fumigating bellows, which she was holding in her hand, and ran off to the house with all possible speed. We were at a loss to account for the disappearance of our fair friend, but in a short time, the mystery was solved. The insidious bees not finding any part of her frame exposed in which they could inflict their stings, had mischievously crept up her stockings, and having arrived at a vulnerable part, they proceeded immediately to wreak their vengeance in the most summary manner upon the lawless despoiler of their property.

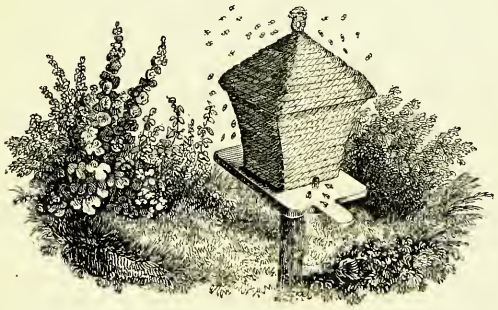
In regard to the danger of being stung, we consider all hives to stand nearly upon a par; and it was rather invidious on the part of Mr. Bagster, to attribute to the Huish hive a greater degree of danger than to any other hive, and especially the ladies' *safety* hive, not one principle of which is founded on good practice, or in unison with the general habits of the bee; in fact, to give a specification of it would not be attended with any advantage or instruction to the bee master, with the exception that it would furnish to him another proof of the extent, to which the enthusiasm of some apiarians has carried them.

One of the greatest advantages of the Huish hive is, that a piece of honey comb may be had almost at any time; and when the bees lie out in clusters, indicating that they are in want of room in the hive, the extraction of the side combs will give them the space required; a partial harvest of honey

will be obtained, the vacuum will soon be filled, and at the appointed season, the hive may be deprived of that portion of its store, which it may not require for its winter use.

Another great advantage is, that by opening the flaps of the cover, the whole interior of the hive is open to inspection; and as it is in general at the top of the hive, that the moth commences its ravages, and other noxious insects take up their habitation for the winter, the evil is discovered before it has attained to that height, as to baffle every remedy that may be applied. It is on this account, that we entertain so decided an objection to the common cottage hive, and indeed to all those hives, in which any operation with its interior must be carried on from the bottom. The eradication of the moth from the cottage hive amounts nearly to an impossibility; and in fact, the ravages of that destructive insect seldom show themselves in the straw hive, until its ruin has been completed. In all the hives on the storifying system, the same insuperable objection prevails; the stories or partitions are entirely closed from any interior examination, except a very limited one from the bottom, and we do not consider ourselves liable to the charge of exaggeration, when we assert that the loss of the majority of hives is to be attributed to the impossibility of a full interior examination.

The make of our hive was originally round. It was however soon discovered, that that shape carried with it the



disadvantage of having the side combs very small, and therefore after much trouble, we succeeded in bringing it nearly to the square, by which the side combs are nearly as large as those in the middle. The hive, as it now stands in our garden, is represented by the accompanying figure.

It has been asserted by a number of scientific men, that the shape of the hive possesses considerable influence on the prosperity and labour of the bee. On what that opinion is grounded, we are at a loss to conjecture; for if the bees be protected from the influence of the weather, if their habitation be dry and devoid of any noxious effluvia, the shape of the hive appears to them to be a matter of indifference. The choice of the materials wherewith a hive is constructed, is a wholly different question, and therein we do consider that a sound judgment ought to be exercised. Were we required to form a scale of excellence relative to the materials used for the construction of hives, we should place straw undoubtedly as the first, wood as the second, earthenware as the third, and glass as the fourth and the worst. It has indeed been urged by l'Abbé della Rocca, and he is supported in his opinion by several skilful naturalists in France, that earthenware by its power of retaining the heat of the sun, contributes to the fecundity of the queen, and to the early departure of the swarms; but it is to that very power of imbibing and retaining the heat that we object: for Della Rocca himself admits that he has lost many hives by the fusion of the combs, occasioned by the extraordinary heat which prevailed in the interior of the hive, occasioned by the porosity of the material of which it was made. It is for this reason that in Greece, where the hives are chiefly constructed of baked earth, that they put the hives into walls, in order to protect them from the fervent rays of the sun. We cannot here refrain from mentioning a circumstance relative to hives in walls, which we witnessed at the hospitable residence of Monsieur Biège at Lileau, about a mile from St. Hermin.

The worthy proprietor had found it necessary to construct a wall on one part of his premises, and being a most rigid economist, he considered by what means he could repay himself for the expenses, which would be incurred in the building of the wall, and he fell upon the following notable plan. The extent of the wall was about sixty yards; at the interval of every yard, he formed a cavity sufficiently capacious to hold a swarm of bees, and which was closed in front by a hewn stone, in which a hole was made for the ingress and egress of the bees: which stone could be removed at pleasure, when the bees were to be deprived of their stores. When we visited the worthy proprietor, he had forty of these bee-houses well peopled, and in full work, and he informed us, that in three years his bee establishment had amply remunerated him for all expenses incurred in the construction of the wall.

The number of hives invented, and alleged to be original, amount as far as our researches have extended, to fifty three, and the number of those, which are mere modifications of other hives, amount to thirty six; and each of them bears with it the recommendation of possessing some advantage superior to any other, whether referring to the greater harvest of wax and honey, or to the magnitude and number of the swarms. These are however mere chimeræ, which it would be folly to pursue; for we know not of any method, nor do we believe that one will ever be discovered, by which a certain and abundant harvest of wax and honey can be obtained; as that depends upon contingencies, which human skill can neither control nor avoid; such as the season being more or less favourable to the secretion of the mellifluous juices; the particular country which the bees inhabit; the richness or poverty of their pasturage; the abundance or the scarcity of the trees and flowers from which they extract their honey, all or each of which have a direct influence on the fecundity of the queen, and consequently on the annual

difference which generally shows itself in the quantity of honey and wax, and the largeness or smallness of the swarms. And it is from these contingencies, that one mode of management which has succeeded well one year, will not succeed the next, although the exterior circumstances may present the same appearance; and further, it is to these very contingencies and variety of circumstances that we are indebted for the construction of so many hives on different principles, the chief result of which has been, merely to convey to us the information, that bees can inhabit, work, and store up their provisions in vessels of every form, from the excavated trunks in the forests of Poland, to the giant tub of Duhamel; from the urinal vessel of the bedchamber, to the wig of a brow-beating lawyer. In our description of the various hives, we have briefly detailed their defects and advantages, but, with the knowledge, that we had to contend against antiquated prejudices and superstitious notions; we have in many instances merely given the principle of their construction, leaving the individual to ascertain their degree of comparative excellence by the result of his own experience.

ELEVENTH CHAPTER.

ON THE ENEMIES OF BEES.

BEES, A GREAT NUMBER OF ENEMIES—PRECAUTIONS TO BE USED AGAINST THE COMMON AND THE FIELD MOUSE—SIGNS OF THE RAVAGES OF THE MOUSE—ERRONEOUS METHOD OF PLACING THE HIVES, THE CAUSE OF THEIR DESTRUCTION—THE SNAIL, A VILE ENEMY OF THE BEE—THE SINGLE PEDESTAL THE BEST PREVENTIVE AGAINST THE ATTACK OF ENEMIES—THE WINTER, THE SEASON FOR THE ATTACK OF THE MOUSE—CONSTRUCTION OF A MOUSE TRAP—SPIDER WEBS TO BE REMOVED FROM THE VICINITY OF THE APIARY—DEFECTS OF THE COTTAGE HIVE IN ASCERTAINING THE ATTACK OF INSECTS—THE WASP, A FORMIDABLE ENEMY OF THE BEE—OPINION OF REAUMUR—STATEMENT OF MENDEZ DE TORRES (NOTE)—THE DESTRUCTION OF THE MOTHER WASP STRONGLY RECOMMENDED—METHOD OF DESTROYING A WASP'S NEST—ADVANTAGE OF PLASTERING THE HIVE TO THE PEDESTAL—INJURIOUS PRACTICE OF HANGING BOTTLES IN THE VICINITY OF THE APIARY—THE ANT, A GREAT ENEMY OF THE BEE—THE TOAD—THE FIELD BAT—ADVICE OF FEBURIER—CONSTRUCTION OF A RAT TRAP—BIRDS, GREAT ENEMIES TO BEES—THE WOODPECKER—THE TOM TIT—THE SWALLOW—THE WAX MOTH—SIGNS OF THE ATTACK OF THE WAX MOTH—DESCRIPTION OF THE WAX MOTH—ACCOUNT OF THE MANNER IN WHICH IT DESTROYS THE COMBS—SEASON OF ITS APPEARANCE—OPINION OF THE FRENCH APIARIANS—METHOD OF LOMBARD FOR DESTROYING THE WAX MOTH—THE DEATH-HEAD MOTH—ITS EFFECT ON THE BEES—FORTIFICATIONS, ACCORDING TO HUBER, ERECTED BY THE BEES—CONFIRMED BY MR. LOMBARD—BEES INFECTED WITH LICE—DOUBTS OF THEIR INJURY TO THE BEES—THE BEAR—THE FOX—THE BADGER—SAGACIOUS PLAN OF THE BEAR TO OBTAIN POSSESSION OF A HIVE—ANECDOTE OF A FOX BY MR. DUCARNE—THE PIGS A DANGEROUS ENEMY TO HIVES—A LITTER OF PIGS STUNG TO DEATH—THE LIZARD—THE NEWT—PLAN ADOPTED BY L'ABBÉ DELLA ROCCA FOR THEIR DESTRUCTION—GENERAL REMARKS.

THERE are amongst the animal tribe, few creatures who have a greater number of formidable enemies than the bees. Notwithstanding their sting, so dreaded by the greatest of all their enemies, man, and which in many instances is so effectual for their defence, there are amongst the feathered tribe many, which swallow the bees whole, or they appear to make it a matter of amusement to kill them and then to pick the bodies to pieces, without apparently appropriating any part of them to the purpose of food. Amongst the insects there are many, which are their superiors in strength, who

attack and kill them for the purpose of devouring them. There is scarcely any season in which the bees are secure from the attacks of their enemies. In summer, they are kept in a continual state of alarm and agitation by the wasps, moths, ants, and earwigs; and in winter, they are subject to the destructive visitations of the mouse, who prefers the warmth of a hive, and good cheer before him, to his cold domicile in the ground, and to a precarious subsistence obtained by personal exertion and robbery. The depredations of the common and the field mouse may be always prevented by the provident bee-master, by so contracting the entrance of his hive at the commencement of the winter, that only a single bee can come out at a time. We have, however, experienced, that this precaution does not always succeed; for the cunning animals, finding their ingress into the hive prevented, where they expected to find it, have proceeded to gnaw away a portion of the lower band of the hive, and thereby steal into the hive, as they suppose unperceived; but the vigilant bee-master, on taking the periodical survey of his apiary, will soon discover the secret inroad of the animal, if he observe on the ground a number of nibbled straws, which will be an indication to him that some evil has been committed to his hive, and the cause of it will soon present itself. As, however, in all cases, a preventive is better than a remedy, so it is with the inroads and attacks of the enemies of the bees; for in the majority of cases, it is within the power of the bee-master to adopt those measures, by which he may bid defiance to all the enemies of the bees, with the exception of those, who obtain admittance into the hive by their wings. It is the careless and injudicious manner in which the hives are generally placed, that exposes them to the attack of their enemies; and in some instances, it has come under our observation, that the proprietors of hives, so far from adopting any precautionary measures, have, literally, liberally supplied the enemies of

their bees with the means of making their attacks. Sometimes, the hives are placed so close to a hedge or paling, that the ants, the earwigs, and the spiders have, as it were, a ladder provided for them, by which they can ascend into the hive; at another time, the hives are placed so near to the ground, if not on the ground itself, that the slugs, the snails, the lizards, and other vermin can obtain easy access to the hive, and carry on their depredations unknown to the careless proprietor. A snail is a vile enemy of the bee, not so much for the quantity of the provisions which it consumes, as for the injury which it commits to the combs. The creature, except in the winter is seldom at rest, and invigorated by the warmth of the hive, it crawls over the combs, leaving behind it its track of slime, which is so hateful to the bees, that rather than endure it, they will leave the hive altogether.

The single pedestal is one of the best preventives against the attacks of almost every enemy; to ensure success, however, the bottom of it must be covered over with some unguent, such as pitch or tar; or a piece of sheep's skin with the wool on, will be found, of all preventives, the most efficacious.

It is in the winter that the attack of the mouse is most to be dreaded, and therefore every means should be taken for its destruction. It is however the field mouse, more than the common house mouse, which takes up its winter quarters in a hive, and, therefore, we generally keep some traps of the following construction in the immediate vicinity of the apiary. Let a pea be soaked in water, then draw a thread through it, and tying the two ends to two small sticks, place them in the ground the exact width of a brick; the brick is then, like an inclined plane, placed gently upon the thread, when the mouse coming to eat the pea, gnaws away the thread, on which the brick falls, and kills him. By means of this simple trap, we have killed three and sometimes four mice in one night.

All spider webs should be carefully removed from the vicinity of the apiary; and in this respect, the bee-master cannot be too vigilant in the months of August and September, when the spiders abound, and construct their webs in every quarter. It is believed by some persons that the size and weight of the bee will carry him through the web, but in this opinion they will find themselves deceived. It may happen in isolated cases; but we have too often witnessed the corpse of a bee in the web of the spider, to doubt for a moment the great evil, which the spider commits in the vicinity of an apiary. We, in general, do not satisfy ourselves with brushing away the web, but we also brush away the cause of it, by effecting the death of the spider; for the removal of the web is but a temporary remedy, as perhaps before six hours are elapsed, another will be found at no great distance from the former one.

It is not, however, the common garden spider, which insinuates itself into the hives, but that particular species, which spins its web in the corners of our rooms. Towards the close of autumn, they steal into the hives, deposit their eggs between the bands of straw; and thus, at the commencement of the season, the eggs are hatched by the increased temperature of the hive, and the bees become subject to a perpetual and irremediable annoyance. It is on this and similar circumstances that our objection to the common cottage hive, and indeed to all those, the make of which prohibits the examination of the upper part of the combs, is founded. The proprietor, from the make of the hive, has no means of knowing that the spider or any other vermin have made their lodgement in the hive, and therefore, with the ignorance of the existing evil, the gradual decline and ultimate loss of the hive become a problem, which he cannot solve; and after divining a number of causes, the real one is perhaps the very last that he will be disposed to fix upon or acknowledge. As long as the common straw

hive continues to be in general use, it is in vain to prescribe the necessary remedies for many of the evils, which attend the management of bees, as they cannot possibly be reduced to practice on account of the insuperable obstacles, with which the peculiar construction of the hive is attended.

The wasp may be considered as one of the most redoubtable of all the enemies of the bees. According to several writers, and especially Reaumur, it is asserted, that the wasps not only devour the honey, but the bees themselves. From our own experience, however, we cannot verify that statement; on the contrary, we never witnessed a wasp attempt to enter a hive, and the bees attacked him, that he did not exhibit the arrant coward, and hasten to save his life by a precipitate retreat. Reaumur says, I have often seen the hornets, and even the common wasps, that are not larger than the bees, hover about a hive, and run about on the pedestal for the purpose of espying the favourable moment to pounce upon a laborious bee, returning from the fields, fatigued and laden with pollen, and who makes the most useless efforts to defend itself, for in a moment it is killed. Sometimes the wasp flies away with its prey, but at others it consumes it on the spot. I have frequently seen the bees occupied on the flowers, gathering their honey or farina, which have been seized upon by the wasps and carried away *.

The destruction of a wasps' nest is a task of no little difficulty, and, therefore, we prefer in the months of February and March to keep a strict look-out for the mother or queen

* In a work entitled *Tratado Breve de la Coltivacion y Cura de las Colmenas &c. compuesto por Luys Mendez de Torres*, A brief Treatise on the Management of Bees, by LOUIS MENDEZ DE TORRES, we find the following statement relative to the wasp. "There is a great deal of cunning manifested by the wasp in its attack upon the bee, for it is not the body of the bee, which the wasp eats, but it bites that part nearest to the vesicle, in which the honey is deposited, and having emptied it of its contents the wasp flies away to attack another:" did this circumstance escape the notice of Mr. Reaumur?

wasps, who about that time are roused from their hibernating state, and sally forth to found their colony in ruined walls or banks. The destruction of one queen wasp is tantamount to the destruction of hundreds, and, we may add, of thousands of wasps; and as in that early part of the season, there is not a common wasp in existence, the bee master ought to congratulate himself upon the death of every *large* wasp that he can accomplish, for he may be certain that it is a mother wasp. In some parts of Scotland, the wasps are so numerous, that the existence of every hive is endangered; and as few of the cottagers are aware of the injury, which the wasps commit upon their hives, they are suffered to carry on their depredations with impunity, until the hives are wholly destroyed. In Perthshire, we killed one morning twenty-nine mother wasps; calculating, therefore, that a wasps' nest contains, on an average, six hundred wasps, we that morning prevented the birth of 23,400 robbers, to be let loose upon the world, to live upon the labours of the industrious bee. If the bee master cannot spare the time, nor is possessed of patience sufficient to continue the chace after a mother wasp, let him offer a premium to the cottage boys for every mother wasp, that they will bring him. We offered a penny to the urchins living in the immediate vicinity of our apiary for every wasp that they would bring us, and not an evening elapsed without a call being made upon us for fifteen or twenty murdered mother wasps.

Some persons are apt to suppose that the stopping up of a wasps' nest, is equal to its destruction. There is, however, no truth in the supposition, for it is wonderful in what manner these insects will work their way through a barrier, supposed to be impenetrable. We have frequently plastered up the aperture of a wasps' nest at the close of the evening, by which we supposed that we had accomplished the death of the inmates of it by gradual starvation; but on visiting the nest on the following morning, we have found, to our surprise,

that the wasps had obtained an outlet, and were joyfully amusing themselves, as if in ridicule of our puny efforts. The only certain method of destroying a wasps' nest, is by sulphur; but the difficulty of arriving at it, is sometimes great, on account of the depth at which it is built in the ground, which baffles the patience of the most inveterate wasp hater, a character which generally belongs to all keepers of bees.

The provident plan of plastering the hive to the bench or pedestal on which it is placed, is an excellent guarantee against the depredations of the wasp; for they, who have paid a strict attention to the motions of that insect, must have frequently perceived, that when the wasp has been repulsed from the entrance of the hive, by the boldness and vigilance of the bees, he takes a survey of all the other parts of the hive, particularly the back part, and so keen is his eyesight, that he will immediately discern the slightest crevice, through which he can obtrude his body into the hive, and if one has discovered it, there will soon be a hundred to follow his example.

We are far from recommending the practice adhered to by many keepers of bees, of hanging bottles filled with some saccharine liquid in the immediate vicinity of the hives; for although a few wasps may be destroyed by it, yet they act rather as objects of invitation to the robbers, and undoubtedly entice a greater number into the neighbourhood of the apiary, than would perhaps otherwise have approached it. Independently of this disadvantage, the bees themselves are most greedily disposed to partake of any saccharine fluid within their reach; and hostile as the wasp and the bee may be towards each other, when the former invades the territory of the latter, yet we have often seen them partaking in social fellowship of any sweets, which chance may have thrown in their way. A bee will visit a bottle of sugar and water as greedily as a wasp, and that which will drown a wasp, will drown a bee; it therefore scarcely amounts to a

question, whether the life of one bee be not dearly purchased by that of a dozen wasps.

The ant claims no secondary rank in the number of the enemies of the bees; but in regard to the bees themselves, no fear whatever need be entertained for their safety. The ants are very capable of gratifying their appetite for the mellifluous stores of the hive, but they appear to know to what they would expose themselves, were they to proceed to the pillage of a well-peopled hive. We have often admired the choice, which certain ants have made of the place in which they have established themselves, in comparison to that which they might have chosen, and which combined within itself greater advantages, than any other, that might have been offered to them. On opening the shutters of my glassed hives, I have often found hundreds of ants, which had established themselves between the shutters and the panes of glass; and they had even transported thither their eggs, their larvæ, and their nymphs, the number of which equalled, and sometimes surpassed that of the ants themselves. Where in the whole garden could they have found a place in which they could enjoy so high and regular a degree of heat? But at the same time, not an ant was to be seen in the inside of those hives, which had so many of them on the outside, although they could have found a number of crevices by which they could have entered; and which, no doubt, they possessed every disposition to do, if the honey had not been so vigorously protected. When, however, we have left any hives for a few hours in the garden, the bees of which have died, the ants then, who have nothing to fear, hesitated not instantly to regale themselves with the honey, which had remained in it; but we never witnessed that they offered any annoyance to those bees, which belonged to a well-peopled hive.

The toad is a ravenous enemy of the bee, but it seldom happens that the ugly animal can carry on his ravages without immediate detection; yet, there are particular occa-

sions, when his visits to the hives cannot be ascertained, as they are generally paid during the night. In hot sultry weather, when the bees lie out during the night in clusters for the benefit of the air, the toad will frequently place itself under the cluster; and as it frequently happens that a few will fall to the ground, the toad makes a dainty meal of them, before they can regain their companions. We once killed a toad under one of our hives, and found nineteen undigested bees in its stomach. This appetite of the toad for bees is confirmed by Lapoutre, who, in his *Traité sur les Abeilles*, mentions that he once found twenty bees in the stomach of a toad. The wasp, as well as the bee, is a *bonne bouche* for the toad; but if he would let the latter alone, we would not quarrel with him as to the number which he might devour of the former, and under those circumstances, he should have our zealous co-operation in the augmentation of his species; but, as he exhibits such a decided partiality for the bee, a spade or a rake generally puts an end to his existence, and we advise all keepers of bees to follow our example.

The field rat has been classed amongst the enemies of the bees, but we do not believe that any are bold enough to dare to enter a hive, the bees of which are in a state of even ordinary activity: they would suffer severely from so dangerous an experiment, for they would not be able to offer any resistance to the multitude of stings which would be poured into them. It is, however, certain that one field rat will in one night destroy the most populous hive. Lombard mentions an instance of entrapping a field rat in one of his hives during one of the cold nights of May, and that the platform was covered with the remains of the bees, which the animal had begun to devour. We never knew but one instance of a hive suffering in this country from the ravages of the field rat; and to prevent its ascent to the hive, it will be found of great benefit to drive a number of tenter hooks

into the pedestal, some with the point upwards, and some downwards; but Feburier says, that the hives ought to be placed at least three feet from the ground to secure them from the field rat, for at the ordinary height at which the hives are placed, the rat can jump upon the platform from the ground. We will not dispute the saltatory powers of the field rat, but we will lay down a plan by which his jumping spirit may be checked for ever: get a large flower pot; place one stick within and one without, and let the pot rest on a slight piece of twine, in the middle of which is a nut, with the shell half taken off, and through which the twine is passed. The rat will be so eager to partake of the nut, that he will gnaw away the remainder of the shell; in so doing, he will gnaw the twine in two, and the pot will fall over him. This trap is upon the same principle as that formerly described for killing the field mouse.

Birds are great enemies to bees, especially the woodpecker, tomtit, the swallow, and almost all the gallinaceous tribe. In regard to the latter, however, it appears to be more a matter of sport with them, than any fixed habit or epicurean relish that they entertain for the body of the bee; the few, however, that they destroy, cannot have any sensible effect upon a populous hive, but still we do not like to see them about our hives, except towards the close of the day, when they catch the moths, which with the setting of the sun are generally seen hovering about the apiary. In regard to the tomtit, the French apiarians consider it as rather a formidable enemy; for Buffon says, that it employs the following stratagem to satisfy its appetite for the bees. The artful biped, knowing the extreme vigilance of the bees, and that they are on the alert at the slightest sound, alight on the hive, and begin scratching with their claws, and tapping with their beaks; on which, the sentinels come out of the hive to ascertain the cause of the annoyance, when one is caught up after the other, until the little cormorant has satisfied its

appetite. The love of the tomtit for the bees is in a great degree confirmed by Lapoutre, who says, that he saw under a tree, in which there was a tomtit's nest, a surprising quantity of the scaly parts of bees, which these birds had dropped from their nests. A little shot and powder is the surest remedy for these malpractices of the tomtit family, and we never hesitate to apply them, whenever an opportunity presents itself.

But of all the enemies of the bees, the wax moth is the most formidable. In those places where the moth abounds the hives should be frequently visited, and especially the weak ones, in order to ascertain if the moth has begun its ravages. The destruction of a few larvæ at the period of their maturity will prevent the multiplication of some thousands of these insects, which carry with them destruction and desolation through a whole apiary. It is easy to ascertain if the moth has made its lodgment in the hive, by the dejection and lassitude of the bees, and by a cessation from their wonted labours. It is in the tops or coverings of the hives, that these dangerous insects frequently establish themselves, especially if they be made of straw, between the bands of which they deposit their eggs, or spin their cocoons. This examination should be made early in the morning, for the wax moths retire to their recesses when the light appears, and as they do not take to the wing, but run about the exterior of the hive, they are easily destroyed.

In regard to the visitation of the interior, the cottage hive presents itself with all its insuperable obstructions, and therefore we can only describe a few signs by which the existence of the moth in the hive may be ascertained. The hive must be gently lifted up, and the platform carefully examined. If some shreds or fragments of wax be seen, or some yellowish or red grains, which are merely some portions of the pollen, which the larvæ have extracted from the

cells, or if some black grains be seen which are the excrement of the moth, then the conclusion may be drawn, that the moth is carrying on its ravages. Notwithstanding, however, that the conviction is impressed on the mind of the proprietor, that his hive is gradually hastening to destruction, and that he is fully apprised of the cause of that destruction, yet, if his bees be in the common hive, by what means is the evil to be cured? The construction of the hive prevents him from penetrating to the seat where the evil exists, and, therefore, he has only the choice left him of suffocating the bees, to obtain possession of the honey which it may contain, or patiently to await the destruction of the hive, with the total loss of both bees and honey.

Previously, however, to our entering into any further detail of the means by which the wax moth may be destroyed, it may be advisable to impart that information by which this enemy of the bee may be recognised, and, we may add, the most dangerous enemy which this climate generates; for such are the ravages which they commit in some seasons, that their complete destruction would be one of the most inestimable benefits, which could be bestowed upon every one, who makes the culture of the bee his principal study.

Entomology designates two species of wax moths, the *galleria cereana,* and the *galleria alvearia.* The former is the species now under our consideration, and is known by the name of the wax moth, and in France by that of *fausses teignes,* or false moths. It takes its name of galleria, according to Fabricius, because its larva or worm moves only in a gallery or tube, composed of threads covered with its excrement and with wax. This moth is of the genus phalenæ, and is seen on the wing only at twilight. Its colour is of a darkish grey, with small spots or blackish streaks on the interior edge of its upper wings; it is about six lines in length. When the female is about to lay her eggs, she steals into the hive at night, and deposits them on the interior

sides of the hive, or even sometimes on the side combs: it then leaves the hive, and it is supposed, that it dies soon afterwards. From every egg bursts forth a worm, which in its turn becomes a moth. It appears at first in the form of a larva, and it is in this state, that it commits such terrible ravages. This larva is of a palish white; the head brown, having sixteen feet, by which it regulates its motions, and spins the silken threads, with which it constructs its galleries. These galleries or tubes are at the first composed of but a few threads; but in proportion as the insects advance in growth, they consolidate them by augmenting the number of the threads, and adding to them a part of their excrements, and some particles of wax.

As it is neither honey nor wax which is the object of their desire, although, when pressed by hunger, they can subsist upon the latter, they pass from one comb to another until they arrive at those which have served, or which still serve, as the receptacles of the brood of the bees, and in which that matter is contained, to which they give the preference. They then change the direction of their galleries, stopping in a comb as long as they find any sustenance in it, and proceed from one cell to another, until they have attained their full growth. Their galleries in the mean time increase insensibly in diameter, and become eventually sufficiently solid to protect their soft body, which has no particular defence from the stings of the bees. It is by these means, that they penetrate with impunity into the very midst of their armed enemies, against whom they are not provided with any means of defence, having no offensive weapon; and the body, with the exception of the head, which is enclosed in a kind of cuirass, being incapable of resisting the slightest attack.

When the time is arrived appointed by nature for their metamorphosis, the larvæ retire between the platform and the interior edge of the hive, if it be made of wood, or between

the sides, or in a comb that has been abandoned by the bees. They spin a web or cocoon in which they envelop themselves, and in which they undergo the metamorphosis into moths or phalenæ. They then leave the hive to propagate their species, and the female being fecundated by the male, steals in her turn into a hive, deposits her eggs, and thus lays the foundation for those ravages by her progeny, for which her predecessors have distinguished themselves.

It is generally at the close of April or the beginning of May, that this destructive moth first shows itself. The hives should therefore at that particular period be carefully watched; for if a single moth obtains an entrance, it will lay a sufficient number of eggs to cause its total ruin.

If the hive be weak in population, it is inevitably lost, unless the proprietor succeeds in destroying all the larvæ of the moths, and if they have made any great progress, there is no other resource for the bees than to drive them into another hive, provided that the season be so favourable, that they can collect a sufficiency of food for their support. It is the opinion of certain French apiarians, that the greater or less elevation of the hive has a particular effect in promoting or destroying altogether the inroads of the wax moths. They have, however, advanced that opinion, without stating their grounds for it; and we cannot possibly divine what influence the lowness or the height of a hive can have upon the attack of an insect, which by means of its wings can mount or descend at pleasure, and which is sometimes seen even crawling upon the ground. The preference, however, is given to the low position of the hive; and on this subject Feburier thus expresses himself. "If the population of the hive be numerous and *the entrance of the hive very low*, the bees will stoutly resist the admission of their enemies; and if some have taken advantage of a moment of neglect to introduce themselves into the hive, they attack them the moment

they commence their ravages, destroy them, and repair the damage which has been committed."

Lombard suggests a singular method of destroying the wax moth; which is, to place an old hive filled with combs in the apiary, to which the moths will repair, from an instinctive sense of personal safety; the older the hive, the better. We have tried this experiment and to our cost. Having a small apiary at Peckham, and knowing that the neighbourhood was much infested with the wax moth, we placed in it an old hive, according to the instructions of Mr. Lombard. The moths were not long before they took possession of it, but we found that instead of remedying the evil, we had sadly aggravated it. The moths increased wonderfully in the old hive, for it was a comfortable nursery for them; and if they had confined themselves to the old hive, we would have left them in quiet possession of their domicile, but in a very short time, we found that they had extended their visits to every one of the hives, and on turning up one of them, the moths issued out in such numbers, that they resembled a swarm of bees. We hurried away with the hive into the stable-yard, and we were glad to see the poultry devour every one, which had not taken to its wings.

The death-headed moth, (*Sphinx atropos, Linn.* *) is a great enemy to the bee, but it is so rare in this country, that it scarcely deserves being mentioned. In some climates, however, it is considered as a most redoubtable enemy, for according to Lombard and Huber, it not only robs the bees of their provisions, but the very sight of it frightens them to death. Mr. Lombard, speaking of this moth, says, the art, which the bees employ in averting the attacks of this

* A beautiful specimen of this insect, which is so rare in England, was lately caught on the estate of Mrs. Calverley Bewick, at Close House, near Newcastle, and was presented by that lady to the Entomological Society of that town. At its capture, it emitted that shrill and plaintive sound, which has been described by the French naturalists, but which has generally been considered as fabulous.

insect is so extraordinary, that the Vaubans of the present age might take their models from them. When they see, says Mr. Lombard, one of these sphinxes approaching, they immediately retire to the very extremity of the hive, as if to hold a consultation on the most prompt measures to be adopted in order to repel the threatened attack of so formidable an enemy. It is determined *nem. con.* that a line of fortifications shall be immediately drawn out; and accordingly, in the first place, they so contract the entrance with a lump of *wax and propolis,* that the dreaded foe cannot possibly thrust his body through. Not satisfied, however, with this means of defence, they proceed to erect in the interior of the hive, a double wall; then a covered way, then a secret gate, and then battlements, bastions, glacis and counterscarp!!

Now Mr. Lombard does not go so far as to say that he has actually witnessed these fortifications, and therefore we will lay his account of them to the charge of a wild and incoherent fancy, and to an uncontrollable disposition, rather than not impart to us something that was new and original, to tell us something which he must have known to be decidedly false. If, however, Mr. Lombard stands charged with the crime of grossly imposing upon our reason and common sense with his account of these fortifications, to what bar ought we to arraign Mr. Huber, who, not only in the 27th volume of the Bibliothèque Britannique, but also in his History of the Bee, has actually given us a drawing of these fortifications; and, further, in what light ought we to view a professor of Natural History of the King's College of London, who, under a slavish subjection to an authority, the authenticity of which he never attempted to confirm by his own experience, has, in his Insect Architecture, declared the representations of Huber to be correct, and that the bees do actually construct such fortifications as are represented in the drawings of Huber, and which his *blindness* enabled

him to *see*. Huber closes his description of these fortifications with the following attempt at the sublime; "How has this foresight been accorded to those creatures which, as we believe, have not received the gift of intelligence! These observations are continual hymns of adoration addressed to the Author of all things."

It is not yet a determined point, whether the little insect with which the bees are afflicted ought to be classed in the rank of their enemies. It is undoubtedly a species of the louse, which is not found on any other kind of fly. It is scarcely or ever found upon the young bees, but solely upon the old ones, and it is also the old ones only of certain hives which are subject to it. In general, only one of them has been discovered upon each bee, and no great trouble is required to obtain a view of it; it is of a reddish hue and about the size of the head of a very small pin. It is almost always to be found on the corslet, but no favourable opinion is formed of those hives, the bees of which are infected with these vermin. But the question is, are they in reality anywise injurious to the bees? and it may be answered, as far as our observations extend, in the negative; at all events, it is certain that they do not cause them much pain or annoyance: for, although it may not indeed be so easy to the bee to draw one of its feet over its corslet, as over any other part of its body, (and it is perhaps that very circumstance which determines the louse to place itself there,) yet it is to be seen in many places from which the leg of the bee might easily dislodge it, but where it is nevertheless allowed to remain unmolested. On the whole, these insects are considered as highly injurious to the bees, and various remedies have been proposed for their extirpation, but without any decisive success.

Amongst the quadrupeds, the bear, the fox, and the badger, may be classed as being the principal enemies of the bees. The former, being an animal no longer indigenous

to this country, all mention of him may be considered as irrelevant. We cannot, however, refrain noticing the manner in which the bear obtains possession of the contents of a hive, in those countries which are subject to its visitations. It is seldom known, according to l'Abbé della Rocca, that the bear attacks a hive openly; for although his shaggy hide may protect him from the fury of the stings of the bees, yet his muzzle is by no means protected; and the bees appear to be endowed with the instinct of always attacking the most vulnerable part of their assailants. The bear is also conscious to himself that his muzzle would be pretty well punctured with stings, were he to manifest an inclination to appropriate to himself the contents of the hive as it stands in the apiary; he therefore takes the hive between his paws, and carries it to the first pond or river, into which he plunges it, until all the bees are drowned. In those countries, therefore, which are infested by the bear, the bee masters fasten their hives to the walls or posts, so that the bears cannot detach them; but he is an enemy so very conspicuous, and so soon discovered, that a couple of bullets can soon put an end to his predatory visits.

The fox is a truly formidable enemy in some countries; but although we once possessed an apiary in a district in which that animal abounded, we never knew a single instance in which the hives were attacked by it. Speaking of the fox as an enemy of the bee, Mr. Ducarne says, "These rascals of foxes eat the bees as well as the honey, but it is the honey to which they are the most partial. For two years, a particular fox came every winter to overthrow my hives. I put a chicken and some bread to amuse him, and some poison to kill him; but no, the cunning thief would not touch either; he went directly to the hives. Mark the sagacity of the animal: he would not come in summer, when the bees were in full vigour, as he knew in what manner he would be received; but he steals slily to the hives when

the inhabitants are in a state of torpor, and thus obtains their treasure without incurring any danger himself."

There is, however, an animal indigenous to this country, which we dread to see in the midst of our hives, more than all the foxes in the neighbourhood, and that is a pig, who, without possessing any immediate relish for the contents of a hive, will frequently overthrow it, from that restless spirit of mischief and destruction, which is inherent in the animal. It is proverbial that good cometh out of evil; and we once knew a cottager, who had his hives placed on the ground, when his sow with a litter of pigs after her, having obtained admission into his garden, overthrew either by design or clumsiness one of the hives. The screams of the little pigs, and the loud gruntings of the old sow, who were all furiously attacked by the bees, attracted the cottager to his garden, when he saw the damage that had been committed, and the same night witnessed the death of six of his pigs. The cottager wisely determined to place his hives beyond the reach of the old sow in future; and thus a pig effected, what perhaps all the power of human reason would not have been able to accomplish.

The lizard and the common newt are great enemies of the bees; but if the hives be placed on pedestals, they are safe from the depredations of those vermin. The Abbé della Rocca describes the lizard as a truly formidable enemy, and with the view of arresting its depredations, an earthen pot glazed on the inside is put into the ground, half filled with water, the edges of it being parallel with the surface. The lizards fall into the water and are drowned, and it not unfrequently happens, that a mouse falls into the same trap.

In general, it ought to be strongly impressed upon the mind of every keeper of bees, that the attacks of their enemies are generally carried on in secret, and therefore he should always be upon the alert to destroy them, before his property has received, perhaps, an irremediable injury.

TWELFTH CHAPTER.

THE PILLAGE OF HIVES; ITS SIGNS, AND METHODS OF PREVENTION.

THE PILLAGE OF HIVES NOT PROPERLY ATTENDED TO—ERRONEOUS OPINION OF LOMBARD—THE CHIEF CAUSE OF PILLAGE—PARTICULAR DAYS AND SEASONS IN WHICH THE PILLAGE IS CARRIED ON—MARCH AND SEPTEMBER THE PRINCIPAL MONTHS OF PILLAGE—METHOD OF KNOWING THE PILLAGING BEES—SIGNS OF PILLAGE—FREQUENT VISITS TO BE PAID TO HIS HIVES BY THE PROPRIETOR—YOUNG BEES TO BE DISTINGUISHED FROM PILLAGING BEES—METHOD OF DISTINGUISHING THEM—PREVENTION OF PILLAGE—THE ENTRANCE OF THE HIVE TO BE CONTRACTED—HIVES THAT ARE ATTACKED TO BE REMOVED—WEAK HIVES TO BE FED—THE REMOVAL OF A HIVE NOT ALWAYS A REMEDY—AN EMPTY HIVE TO BE PUT IN THE PLACE OF THE ONE REMOVED—CONCLUDING REMARKS.

THERE is perhaps not any circumstance connected with the management of an apiary, to which less attention is paid, than the pillage which is carried on, not only by the bees of the same apiary, but by stranger bees, and to which may be attributed the loss of many valuable hives. Lombard, who, although undeservedly so, is quoted as a high authority amongst the apiarians of France, assures us that a hive is never pillaged, except on the death or the sterility of the queen; an opinion, to which not the slightest value should be attached. It may, indeed, be admitted that a hive will be pillaged when the queen is no longer able to perform her functions, but it is well known to all keepers of bees, who are versed even in a slight degree in the management of their hives, that the bees, which are in the same apiary, and who possess a fertile queen, pillage each other, especially in the spring and the fall of the year. The swarms of the early part of the summer, being in a state of famine before the plants and flowers can supply them with a proper quantity of food, are driven by want to acts of pillage, on nearly the same principle that the late swarms in August, which have

not been able to collect a sufficiency of provisions, consider themselves entitled to rob their neighbours of their superfluous store. It sometimes, indeed, happens, that the bees, who inhabit the most populous and well provisioned hives, betake themselves to the predatory system, and desolate those which are in a weaker condition.

The chief cause which excites bees to pillage, is a natural greediness and an over-anxious desire of collecting provisions for the purpose of enriching their own domicile. The bee in its nature is a most insatiable insect; not exactly in regard to the satisfaction of its appetite, but to the amassing of those provisions, which are to protect it from want during the winter; and this accounts for the best provisioned hives carrying on the system of pillage to its greatest extent; for, being conscious of their own strength, they know that they have nothing to fear from the attack of others; and it may be said, that it is only the weak hives, which suffer from the pillage of their own race. Actual want and necessity may, however, sometimes be taken into the account; for it is no unusual case, that the best peopled hives are precisely those, which are the most in want of provisions, and therefore they fall upon the weaker societies, which, from the paucity of their numbers, are better provided with food.

There is, however, another source of this evil, and which is very prone to happen in the common straw hives. This arises from the moths and other insects, which penetrate into the hive and there multiply, devouring and spoiling all the works of the hive to such an extent, that the bees, judging it most advisable to leave their domicile, defend it but weakly, and then leave it as a prey to the first comers. Afterwards these wandering and vagabond bees seek in their turn to live at the expense of others; if they be very numerous, they besiege another hive, driving out the lawful proprietors of it, and ravaging their provisions without mercy. Those, which have been driven from their dwelling

go in their turn in quest of food, or rather on the pillaging system; and thus the evil, by force of example, becomes, as it were, epidemical. The best furnished hives are for this cause often seen desolated, and entirely ruined. The bees of those hives, which have been gnawed by the mice and other animals, or which have experienced the cruel visitations of the wasps and the hornets, are often obliged to forsake their homes, in order to seek for subsistence in other hives, more healthy or better furnished.

Such are, in short, the principal causes of the pillage of the hives, an evil of such serious and injurious consequences, that the utmost vigilance should be used to prevent it.

There are some days and seasons in which the pillage is carried on to a much greater extent than others. This is a circumstance very easily to be accounted for. The pillage is most to be feared after two or three days of rain, when the weather is not suitable for the collection of honey, for hunger then presses more severely on those hives, which have suffered from a want of provisions: and as idleness is the mother of all vices, the bees, having no other occupation on their hands, determine upon paying a visit to their neighbours, and robbing those, who are weaker than themselves.

In regard to the seasons in which the evil exists to the greatest possible extent, it may be reckoned that there are two in the year. The first may be computed from the month of March to the middle of May. From that time to the end of August or the middle of September, it is very rare that a hive is attacked by robbers. As soon as the honey season begins to decline, the pillaging bees are seen hovering round particular hives, as if reconnoitring the exact point where the attack is to be made. We would advise the apiarian to pay particular attention to that hive, about which he sees a number of bees hovering on the wing; their presence bodes no good to it, and he must not be surprised,

if in a few days he finds it formally and vigorously attacked by a whole gang of robbers.

As, however, prevention is in all cases better than a remedy, it is actually necessary that every apiarian should make himself acquainted with the principal signs which display themselves when a hive is about to be pillaged.

In the first place, a more than ordinary noise is heard before the hive, and also throughout the whole of the garden, and if the ear be placed to the hive, the noise within resembles a loud hum, which arises from the motions of the bees, some defending their provisions; others robbing them, and as those bees, which are to be seen entering in crowds, come and depart with great glee and precipitation, the increased noise is accounted for, which is heard in the garden.

Battles and duels are then seen at the entrance of the hive, which is besieged at all parts; some bees enter in haste, others depart with the utmost velocity, and almost all of them are fighting, some to effect an entrance by force, others to prevent it; whilst others are busily engaged in driving out those, who have already obtained admittance. Some are observed in the pursuit of others, whom they catch hold of by their hinder legs or their wings; and who, knowing that their life is in jeopardy, are seen making every effort to escape. Others fall upon those who arrive, and often upon one of their own community, whom they are prevented recognising from the anger by which they are instigated, and to whom they seem disposed to give no greater degree of quarter than to the strangers. In fine, it is on the whole a disorder, a confusion, a frightful carnage before the entrance of this ill-fated hive, which scarcely knows friend from foe, and the bees of which attack each other without discrimination.

When, therefore, several bees are seen hovering about, and particularly before the entrance of the hive, and they are seen to alight at times near the bees, which guard the

entrance, and fly away with rapidity; and finally, when a bee of the hive recognises the daring robber, then may the hive be considered as in great danger. These bees may be called the foragers or the advanced guard, who are sent forth to discover the most vulnerable point of the hive on which the attack is intended to be made. Further, if on closely examining the hive, a bee is perceived to dart upon one, or upon a number of others which hover about the hive, and that this bee, after having pursued his enemy returns immediately to join his companions, and places himself with them in a menacing posture, which is not difficult to be ascertained by those, who are in the habit of watching the motions of these extraordinary insects, the conclusion may be instantly drawn, that this hive is threatened with pillage. These bold and audacious robbers are seen to pass with an astonishing rapidity before the entrance of the hives, where the domiciliated bees are always on their guard against their enterprise. Sometimes they alight with the greatest effrontery in the very midst of those who guard the avenues, and then take to their wings with the utmost precipitation; when they see some of the domiciliated bees, who have no idea of taking a joke, pounce upon them, and, like the death-head hussars, give no quarter to the enemy.

At another time, when the robber delays his escape too long, a bee of the hive catches him by the hinder leg; and yields not its hold until the intruder takes wing, dragging his enemy after him. If, during this struggle, two or three other bees should come to the assistance of their companion, woe then to the robber; he is seized by the legs and wings, and he may deem himself fortunate indeed, if he escape with his life.

When these signs present themselves, the greatest fears may then be entertained for the hive, and if, instead of one or two bees hovering about it, a number are seen, dodging here and there, the conclusion may then be drawn that the

weakness of the hive has been discovered, and that it is on the eve of being regularly and formally attacked. It becomes therefore a particular part of the duty of the apiarian to pay frequent visits to his hives during the seasons when robberies are the most prevalent. Particular care, however, should be taken not to confound the robbing bees with the young ones, who from the hours of twelve to three amuse themselves by flying about the hive in great numbers, and whose motions very much resemble those of the pillaging bees. There are, however, particular signs by which the attentive observer may distinguish the young bees from the strangers, who are meditating an attack. The young bees keep constantly before the entrance of the hive, and they have always their head turned towards its centre, whereas the besieging bees dodge about the hive in every quarter, without confining themselves to any particular position.

There exists a very simple method of ascertaining whether the bees, which are hovering about in numbers before the hive, belong to the apiary, or whether they be robbers. Sprinkle some flour on the bees, and then watch if any of them enter the hive without opposition, which immediately determines if they be friends or foes.

In regard to the prevention of pillage, if there be a weak hive in the apiary of which any fear is entertained, let the following plan be adopted. The hive must be instantly removed from the apiary, and placed in a retired situation in the garden, about five or six hundred paces, or a quarter of a mile distant, and it should then be covered with branches or fagots, to protect it from the view of the bees flying into the fields in search of food.

The entrance must be so contracted as to admit of only one bee to come out at a time, which is very easily done with putty or clay, or still better with one of our tin entrances; in which state the hive must be left until it be

perceived that it is wholly tranquil, and that it is no further molested by stranger bees.

The removal of the hive, however, must in some measure depend on the discretion and judgment of the proprietor, especially when the pillage is supposed to proceed on account of two or three days being adverse to the collection of honey ; because, under such circumstances, it would be sufficient to close the entrance of the menaced hive, leaving open merely a small aperture for the bees to inhale the air. It is a plan, however, which we generally follow when we see a hive threatened by robbers ; but if, on opening it, two or three days afterwards, it is still perceived to be in danger, we then lose not a moment in removing it.

As the greater number of the hives which are tormented by robbers are weak and in want of provisions, it would be advisable to give them a little food in the evening after sunset, taking care at the same time so to close the entrance, that no stranger bee can gain admittance ; for were this precaution neglected, the danger of the hive is increased, not removed. Considerable judgment is required in the feeding of weak hives, for from a want of the necessary precautions, we have often seen a whole apiary put into commotion, and especially if the food has been administered exteriorly.

It has frequently fallen under our experience that the removal of a hive to a distant place is not always a cure for the evil that prevails, for such are the activity and vigilance of the bees, that they will discover a weak hive at any distance from the apiary. Under these circumstances, we advise the proprietor to take the hive into a granary or other outhouse, in which there is a window fronting the south, at which the hive must be placed, but the entrance so closed that no bees can come out. A little food should be given to them ; and in about three or four days, the window may be opened, and the bees set at liberty. This, however, must only be done in very fine weather. Should the hive be

discovered by the strangers, the window can be immediately closed, and all further attack is then prevented. In this case, however, a number of the native bees, who actually belong to the hive, will be necessarily excluded, and which perhaps cannot obtain admission without also admitting the strangers. In the course of an hour, however, the strangers, disappointed of their booty, will retire, and the lawful bees may then be permitted to enter.

When a hive is removed, a *ruse de guerre* should be played off, and an empty hive put in its place. This will amuse the robbers returning on the following day, and will prevent them attacking any other hive, which might prove too weak to oppose them; for the same proverb holds good with bees as with men, that stolen goods are sweet; and when the bees of a hive once take to robbing, they follow the occupation with the greatest ardour, and the best apiary, under such circumstances, will be soon depopulated.

THIRTEENTH CHAPTER.

ON THE DECLINE OF HIVES, AND THE MORTALITY OF BEES.

THE DECLINE AND MORTALITY OF BEES DIFFICULT TO BE ACCOUNTED FOR —THE PREJUDICES AND SUPERSTITION OF THE COTTAGERS OF THIS COUNTRY, A GREAT DRAWBACK TO THE CULTURE OF THE BEE—A BAD SEASON THE CAUSE OF THE MORTALITY OF BEES—THE PROGRESSIVE POPULATION OF A HIVE THE CAUSE OF FAMINE—CONSEQUENT DEATH OF THE BEES—FALSE JUDGMENT OF THE COTTAGER—EXTREME COLD NOT INJURIOUS TO BEES—THE GREATER THE TORPOR OF BEES, THE LESS THEIR CONSUMPTION OF FOOD—INJURIOUS EFFECTS OF KEEPING BEES WARM IN WINTER—PLASTERING OF HIVES WITH PITCH TO BE RECOMMENDED—CULTURE OF THE BEE IN RUSSIA—STATEMENT OF GMELIN—THE SEVERITY OF A RUSSIAN WINTER NOT INJURIOUS TO BEES—THE WORKS OF HUBER NOT TO BE CONSULTED ON THE PRACTICAL DEPARTMENT OF THE APIARY—HIS OPINION OF THE EFFECT OF COLD ON BEES —EXTRAORDINARY DISCOVERY OF HUBER—BEE HIVES TO BE USED FOR WARMING APARTMENTS AND GREENHOUSES—ABSURDITIES INTRODUCED BY HUBER INTO THE NATURAL HISTORY OF THE BEE—PARADOX AND CONTRADICTIONS IN THE STATEMENT OF KEYS—MORE HIVES DESTROYED BY HEAT THAN COLD—PRECAUTIONS TO BE USED AGAINST THE RAYS OF THE SUN—AVERAGE HEAT OF A HIVE—ADVANTAGES OF A STRAW TOP TO THE HIVES—HIVES TO BE PROTECTED FROM HUMIDITY—CONFINEMENT IN CELLARS AND DARK PLACES INJURIOUS TO BEES—THE RETENTION OF THE EXCREMENT HIGHLY INJURIOUS TO BEES—SYSTEM OF BURYING HIVES ADOPTED BY SOME APIARIANS—SNOW A GREAT CAUSE OF THE MORTALITY OF BEES—THE DEATH OF THE QUEEN ONE OF THE CHIEF CAUSES OF THE DECLINE OF A HIVE—UNCERTAINTY ATTENDING THE FATE OF THE BEES, WHO DESERT THE HIVE ON THE DEATH OF THE QUEEN—FAMINE, THE CHIEF CAUSE OF THE MORTALITY OF BEES—PREVENTED BY FEEDING—HIVES TO BE WEIGHED IN OCTOBER AND JANUARY.

Of the various kinds of stock, which constitute the domestic economy of a family, there is perhaps no one, the decline and mortality of which are sometimes so difficult to account for as that of the bee; and we are constrained to admit, that it carries with it frequently circumstances of so discouraging a nature, as to have a very injurious influence on an extension of the culture of the bee; to which may be added, the singular prejudices and superstitions, which prevail almost in every country, and in no one more so than in England, in almost every transaction which belongs to the manage-

ment of an apiary. The eradication of these prejudices appears to be a hopeless task, and until that much desired object can be obtained, it is useless to attempt to introduce a better system of management of the bee amongst the cottagers of this country. In vain have we shown the prejudiced peasant that his interest would be promoted in altering his system of management; for, unfortunately, the notion immediately rises in his mind, that in the advice which is given, there is some sinister motive lurking behind it, and with the total rejection of all the rational arguments that are used, he determines to adhere to his antiquated system, although the visible decline and mortality of his hives ought to be to him a most incontrovertible proof of the fallacy of it.

An unpropitious season will generally lay the foundation of the mortality of many hives, and if two or three bad seasons follow in succession, it is only the most unremitting vigilance on the part of the proprietor that can save his hives from destruction. It may, in a certain degree, be true, that the fecundity of the queen is greater or less, according to the badness or goodness of the season; but whatever the season may be, the breeding proceeds to a certain extent; the drones, those greedy pensioners on the commonalty, emerge from their cells in the month of March, and, consequently, an extra supply of provisions is required to satisfy their craving appetites. If, then, a season intervenes in which the bees are prevented from gathering in their stock, at the same time that the population of the hive is daily and hourly increasing, a scarcity of provisions takes place; want generally brings on a gradual weakness in the bees, and they become at last wholly unable to endure the fatigue of their daily labours, and perhaps die in the fields. A liberal supply of food will invigorate and cherish them, but the cottager cannot be brought to believe that any food ought to be administered to his bees, when they have it in their

power to collect it in the fields; although his own sense ought to tell him, that it is of little consequence to the bees what supply of food there may be in the fields, if the weather will not permit them to collect it.

It is a false notion entertained by the majority of bee masters, that extreme cold is prejudicial and even destructive to the bees, whereas, there is no cold in this climate which can destroy a well peopled hive, and it is a part of our system of management rather to expose the bees to cold, than to protect them from it. The cottagers however, and particularly the aged females amongst them, from an amiable and well intentioned motive, entertain the notion that the cold will kill their bees; and therefore they wrap up their hives in old blankets, or any warm substances that they can collect together, little thinking, that if the hive be not well stocked with provisions, they have taken the most effectual means of bringing about its destruction. The greater the cold, the greater is the torpor of the bees; the greater the torpor of the bees, the less is their consumption of food: it becomes therefore a rational deduction, that any means which tend to the decrease of that torpor must be prejudicial to the bees. The great secret of the salvation of hives during the winter is their complete protection from humidity, and, particularly from the penetrating influence of snow; and it is in accordance with this principle, that the plan of plastering over the hives with pitch is at the present time adopted in many countries, and it is a practice, which we should by no means object to see introduced into this country. It is a direct preservative against the lodgment of any noxious vermin between the bands of straw, and in all seasons, the interior of the hive will be dry and wholesome, independently of the durability, which it imparts to the hive itself.

The culture of the bee in Russia furnishes a decided negative to the opinion of many naturalists, relative to the effect of cold on the bees, and ought to carry its proper

weight with the advocates for keeping the bees in a warm temperature. The culture of the bee, which in the greater part of the European countries forms, we are sorry to say, but an unimportant branch of rural economy, is in Russia, on the contrary, a source of existence to many entire communities. So large a quantity of wax is collected in the Russian empire, that, independently of the domestic consumption, from 120 to 150,000 pounds' weight are annually exported to foreign countries from the ports of the Baltic alone; while honey is no less an object of national importance, nearly the whole of Siberia being indebted for a great portion of its supply to European Russia.

According to Gmelin, notwithstanding the excessive cold, there are a great number of bees kept in Siberia, and he reports, "On the road from Casan to Catherina Burg, we found several trees, which were like so many hives of honey. The natives hollow the trunk of an aspen, willow, or lime, or any other soft wood, to the length of five or six feet; at one of the sides, they make an opening of ten or twelve inches long and four broad; they close the opening with a board fitted in a groove, and form some little holes for the ingress and egress of the bees. They place these hives on the edges of the woods, and suspend them to the trees by bands of rushes, in order to prevent the bears from eating the honey, of which they are very voracious. The honey and wax which are obtained, form a considerable branch of the commerce of Casan."

During the winter that we resided in Russia, the thermometer stood during ten days at six degrees below zero. At that time, Sir Charles Gascoigne had an extensive apiary at Zarskoe Seloe about eight wersts from St. Petersburg; and on questioning him relative to the effect of the rigour of a Russian winter on his bees, he assured us, that he never experienced any mortality in his hives, proceeding from the severity of the frost; but, on the contrary, that the bees

were as active in the spring after an intense winter, as they generally showed themselves after a milder one. On leaving Russia in the following spring, Sir Charles made us a present of one of his most populous hives, which we succeeded in bringing to Scotland, and we found no difficulty whatever in acclimating them to this country; but we saw no reason to prefer them, either in industry or the quantity of their produce, to our own native bees.

We most unwillingly quote Huber on any point connected with the practical management of the apiary; and, in fact, in no work extant on the subject of the apiary, is there so little information to be derived relative to the practical department of it, as in the works of that falsely eulogised naturalist; in fact, they never ought to be consulted on the subject, for they are actually destitute of the most common rules, which the uninitiated bee-keeper would wish to know, and which he ought to know, in order to insure to himself, even a partial success. In his observations, however, (page 361) he says "that the bees *are so free from torpor* during the winter, that when the thermometer falls in the open air to many degrees below the freezing point, it remains at twenty-four or twenty-five above it in those hives which are well-peopled. The bees then press closely towards each other, and thus by mutual action increase their natural heat."

According to this opinion of Huber, we find that the bees possess the power not only of preserving, but of actually augmenting the internal heat of the hive, whenever they require it. Without stopping, however, to invalidate so erroneous an assertion, we will proceed to show, according to the discovery of Huber, that so great is the abundance of calorific matter in bees, that they may be made highly serviceable in the heating of apartments, and particularly greenhouses!!! and in those countries, where there is a scarcity of fuel, the discovery is by no means to be sneered at, as a few hives

of bees are all that may be required to diffuse a comfortable heat over the apartment, and, at the same time, the process is so very easy of execution. According to Huber, about twenty hives are sufficient to heat an apartment, and about twenty-five, a greenhouse. In the preceding quotation, he informs us, that the bees are free from torpor; but we are subsequently informed that during the winter, they are in a greater or less degree of torpidity, in which condition no caloric whatever is emitted, a piece of information rather superfluous on the part of Mr. Huber. The first step, however, to be taken on the requisition of heat in the apartment, is to rouse them from their state of torpidity, by agitating and shaking them most violently, and turning them over and over like so many beans in a bushel measure. This most unexpected motion will rouse them from their lethargy, and they will be immediately seized with a most voracious appetite, which they must be allowed to gratify to its full extent, for it is only when the bees are gorged with honey, that the calorific power can be set in motion. The bees having satiated themselves with food are again to be well shaken, when the caloric will immediately exude from their bodies, and the desired heat will be diffused over the apartment!!!

And yet the discoverer of this wonderful property in the bee is Huber, the celebrated Huber, whose authority in all matters relative to the natural history of the bee is held paramount to every other; but who, we assert without fear of contradiction, has introduced into it a greater number of the most extravagant fictions, and the most absurd descriptions, than any other author, not even excepting Butler, who ever wrote upon the subject.

The late Mr. Bagster, speaking of this and other discoveries of Huber, says, "All this you will think at first sight so improbable and next to impossible, that you will require the strongest and most irrefragable evidence before you

will believe it." Now, we have only the evidence of Huber for these impossibilities, and having no other, founded on actual experience, we reject it altogether as fallacious and illusory.

Not less paradoxical and contradictory is Keys in his statements relative to the effect of cold on bees; for he asserts primarily, that in proportion to the mildness of the winter and spring, so is the consumption of the stores of the bees; and in that statement he asserts what is perfectly conformable with truth. He further asserts that as it is certain that extreme cold has no injurious effects upon bees, it follows, that a cold winter is beneficial to them, as it preserves the food, and in weak hives, that circumstance is of great importance. Keys however in the following page (164) says, "The warmer the hives are kept the better." Now this appears to us a gross contradiction, at least, it is a manifest inconsistency, for to tell us in one page that a cold winter is beneficial to them, as it preserves the food; and in the next to tell us, that the warmer the hives are kept the better, proves at least that Keys had not positively made up his mind upon the subject, and therefore left it to his readers to adopt whichever opinion they pleased.

From the foregoing statements we are entitled to draw the conclusion that the mortality of bees is not effected by cold; but we know to our cost, that many hives are destroyed by the other extreme, namely heat. It must, however, be admitted that in this country, there are few summers, the heat of which is so great as to have an injurious effect upon the bees; but still it becomes the provident bee master to adopt such precautions, that the rays of the sun cannot penetrate to the interior of the hive, which we have known to be the case, where the proprietor has neglected to apply the necessary covering. Huber gives the maximum of the temperature of a hive to be 104°,

which he says, and says truly, is a heat intolerable to bees, and which puts them into such a profuse perspiration, the globules of which he has *seen* on their bodies, that they are then obliged to rush out of the hive for the mere purpose of respiration. It is, however, worthy of remark, that in proportion as we profess to advance in the knowledge of the bee, we find ourselves the deeper entangled in contradictions and paradoxes; at one time we find a certain statement promulgated on the basis of ocular observation, and immediately afterwards, we find the same statement refuted and denied on the same principle of personal experience. The maximum of the heat of a hive as laid down by Huber, viz. 104°, may be considered as a temperature which a hive seldom attains in this country; but strange to say, about the year 1833, a person of the name of Nutt uprose amongst the apiarians of this country, who, in despite of the authority of Huber, was bold enough to advance the extraordinary doctrine that the temperature of a hive previously to swarming is as high as 130°. If now a temperature of 104° according to Huber be intolerable to bees, what must be an additional temperature of 26°? Tallow melts at a temperature of 127°; bees' wax at 142°, in what state then must the combs of a hive be at a temperature three degrees above that at which tallow melts? They must be in a state of almost positive fusion, and utterly incapable of being applied to those purposes for which they were made. Mr. Nutt, to whom temperature and ventilation are what retarded impregnation is to Huber, affirms that a hive at a temperature of 140° is at its maximum of perfection; in contradiction to which we affirm that a hive at that temperature is at its maximum of ruination.

Speaking of the effect of the change of temperature of a hive, Mr. Duncan says, (page 83,) "A sudden change of weather about the end of autumn, from a mild temperature to a raw frost, has such an *immediate* effect on the brood,

that it is not uncommon to observe a young bee, which shall have so far succeeded in breaking its prison as to extricate its head, and nearly its shoulders, yet *perishing from cold* in this situation, without the slightest effort on the part of the workers to save the life of a companion, whose rearing has already cost them so much labour." It is statements like the foregoing, which cast such a strong suspicion upon our minds, that Mr. Duncan was not very scrupulous in regard to the veracity of his authorities, when he compiled his History of the Bee in the Naturalist's Library, and that his own ignorance of the atmospheric condition of a hive must be very great, when he could put forth so fallacious a statement, as that the sudden change from a mild temperature to a raw frost has the effect of killing the young bees. By what means did Mr. Duncan arrive at the knowledge that the bees in a hive, whether young or old, were ever killed by the frosts of this country? and when did it ever come under his observation (for in matters of this kind he ought not to rely upon the observation of others) that the sudden change in the exterior temperature had any immediate effect on the internal temperature of a hive, and to such an extent as to prove the death of the bees?

The application of a straw top to a hive possesses a twofold advantage. It protects the hive from the too powerful influence of the sun, as well as from the humidity occasioned by long continued rain, which, if possible, is more prejudicial to bees than heat, for it renders the combs mouldy and musty, infects the bees with the dysentery, and forces them at length to quit the hive. Various schemes have been adopted to protect the bees from humidity; but the majority of them have failed from the extreme lack of judgment, which was manifested in their adoption. Thus, it was recommended by some apiarians to deposit the hives during the winter in a dry and dark cellar, and it is alleged that a

very great advantage is derived from the adoption of that plan, as the bees being in total darkness consume a smaller quantity of provisions. Now, in the first place, when are the bees in a hive in any other state, than in one of complete darkness; for the small quantity of light which is admitted through the aperture is not sufficient to penetrate to the upper part of the hive, where the bees are chiefly lodged? Consequently, confining the bees in a cellar, as far as the darkness is concerned, and its attendant limited consumption of food, is in reality attended with no advantage, but on the other hand, their confinement is accompanied with a very great disadvantage, as it prevents the bees taking their periodical flight on a sunshiny day for the purpose of voiding their fæces. It is no longer a matter of doubt, that these mid-day flights of the bees contribute greatly to the preservation of their health, by enabling them to evacuate that excrement, the retention of which is so highly prejudicial to them. The cleanliness of the hive is also maintained, the air in it is renewed, and we never knew a hive, the bees of which took their periodical flights, which was not the first in the apiary to indicate the signs of the queen having begun to lay her eggs; whereas, on the other hand, we never knew a hive that had been confined during the winter, the bees of which were not in the spring weak and sickly; and further we never yet met with a bee master, who had adopted the system of preventing his bees from all egress from the hive during winter, who could affirm that on the return of spring they were in good health.

Not content, however, with depositing their hives in cellars and dark places, it is the practice of some bee masters to bury their hives, and thereby bring upon them an accumulation of evil, which no after care can remedy. This plan is so subversive of all the principles of good management, so repugnant to the natural habits of the bee, and so injurious to its health and its whole internal economy,

that the mere mention of it is sufficient. Few will try it a second time, and they who have tried it the first, will have to repent of the total loss of their hives.

Snow is a great cause of the mortality of bees, but it is so easily avoided that he who allows one of his bees to perish in the snow deserves to lose the whole of his hives. The snow is no sooner on the ground, than the bees, allured by the great reflection of light, issue out of the hive the first day of sunshine, and falling on the snow, are immediately benumbed to death. In order to obviate this evil, our tin entrances will be found of the most essential benefit; let the two perforated sliders be let down, even on the appearance of snow, nor should they be removed until the snow be entirely dissolved. A sufficiency of air will be admitted through the perforations of the sliders to insure the health of the bees, even should their confinement endure for a month.

The snow should never be allowed to remain on a hive, even although it may have a covering supposed to be impervious to all the influence of the weather. The gradual melting of it will occasion a certain degree of humidity, which cannot fail more or less to penetrate into the hive; which, if it be of two or three years' standing, will by the increased humidity become so rotten, as to be totally unfit for the habitation of the bees.

There is one cause of the decline of a hive, which is difficult to discover, and still more difficult to remedy, and that is the death of the queen. This event takes place in general so secretly, and so secluded from all observation, that the most skilful apiarian frequently finds his hive depopulated, before he has the slightest suspicion of any defect existing in it. In the spring and summer, there are certain criteria by which the loss of a queen may be ascertained, but in winter when the bees are in a state of inactivity, and no means present themselves of thoroughly

examining the interior of the hive, the death of the queen may take place, and the only chance of ascertaining the fact would be finding the royal corpse on the pedestal of the hive. We never could discover the actual fate of those bees who desert the hive on the decease of the queen, for we have frequently known them to desert it, and leave behind them an ample stock of provisions. We have frequently conjectured that they introduce themselves into other hives, which can be easily effected, when the bees, grouped between the combs, are comparatively off their guard, as to the intrusion of strangers, who may establish themselves between the vacant combs, before the native inhabitants entertain any suspicion of the accession of numbers with which chance has favoured them. Whether the bees leave the hive in concert, or individually, is a subject which has excited the attention of apiarians, but no satisfactory result has been obtained.

The most serious and frequent cause of the mortality of bees is undoubtedly famine; but severely ought the bee master to be censured, who permits his bees to die for want of food; and yet we hesitate not to affirm, that it is the cause of the loss of a greater number of hives, than any other calamity, which is natural to them. It forms an essential part of the duty of every apiarian to weigh his hives at the close of the season; and on ascertaining the weight, to be guided in his opinion as to the quantity of food in the hive by the oldness or the newness of it. A new hive that weighs twenty pounds will probably be richer in honey than an old hive that weighs thirty; and this arises from the superabundance of bee bread, which generally abounds in old hives, but of which a very small quantity is to be found in a new one. It may be taken as an established rule, that it is almost useless to attempt to preserve a hive during the winter, the weight of which does not exceed ten pounds. A hive of fifteen pounds may be

preserved by generous feeding, one of from fifteen to twenty pounds stands in need of very little feeding, and one of twenty pounds and above may be considered as safe from famine. In regard to the weight of hives, we always weigh the hive previously to putting a swarm into it; on weighing it therefore in the winter, we obtain the exact weight of the contents of it, and this is a plan, which we strongly recommend to every keeper of bees, and especially to those, who are apt to apply a thick plaster of clay or mortar at the top of their hives, and then include the weight of it in the general weight of the hive. There is one circumstance connected with the consumption of food, which deserves particular mention; namely, that fewer hives die of famine in the northern countries than in the more southern ones; and this arises from the torpidity in which the bees of the northern climates remain during the winter, which acts as a check to the consumption of food; whereas in the southern climates, where the winters are mild, the bees are comparatively in a state of animation, and consume their provisions most greedily; the consequence of which is that if the hive be not well stored, the bees die of famine before the return of the spring.

There are two seasons for the weighing of hives, the month of October, and about the middle of January. By comparing the weight of the hive in the latter month with that which it exhibited in October, the quantity of food consumed will be easily ascertained, and the necessity of feeding accurately determined. The operation of weighing the hives should be performed on a clear day of sunshine; due caution being taken that there is not any snow on the ground, nor the outward atmosphere extremely cold, for the bees may perhaps, to a certain degree, be disunited in the operation, and become so benumbed by the cold as to be unable to regain their position in the hive.

FOURTEENTH CHAPTER.

ON THE CONSTRUCTION OF THE COMBS.

THE CONSTRUCTION OF THE COMBS THE FIRST ACT OF A SWARM—PROPOLIS AND WAX THE SAME SUBSTANCES—COMMOSIS AND PISSOCEROS, TWO SUBSTANCES IN A HIVE MENTIONED BY PLINY—BEES ON LEAVING THE HIVE PREPARED WITH THE MEANS FOR THE CONSTRUCTION OF THE COMBS—THE COMBS ALWAYS BEGUN AT THE TOP OF THE HIVE—DESCRIPTION OF THE FORMATION OF A CELL GIVEN BY HUBER—ITS FALSITY—THE OVARIUM OF THE QUEEN BEE ON LEAVING THE HIVE FULL OF EGGS—PERFECTION OF THE ARCHITECTURE OF THE BEES—BEAUTIFUL CONSTRUCTION OF A CELL—THE COMB COMPOSED OF A DOUBLE ROW OF CELLS—THE CELL OF THE COMMON BEE A PERFECT HEXAGON—MATHEMATICAL ANALYSIS BY SAMUEL KOENIG—VARIETY IN THE THICKNESS OF THE COMBS—DESCRIPTION OF THE QUEEN CELL—WEIGHT OF THE QUEEN CELL COMPARED WITH THAT OF THE COMMON BEES—REPRESENTATION OF THE CELLS OF THE COMMON BEE, THE DRONE, AND THE QUEEN—LATREILLE ON THE STRUCTURE OF A COMB—COMBS WHEN FIRST MADE ARE WHITE—VICINITY OF MANUFACTURING TOWNS INJURIOUS TO THE COLOUR OF THE COMBS—THE WHITEST COMBS MADE ACCORDING TO L'ABBÉ DELLA ROCCA, FROM THE FARINA OF THYME—FALSITY OF THE STATEMENT.

THE first act of a swarm on taking possession of its habitation is the construction of the combs for the reception of the eggs of the queen, and their future provisions. It has been hitherto the generally received opinion that the bees employ a different substance than wax for the foundation of their combs, to which the name of propolis* has been given, and we confess that we were originally inclined to adhere to the opinion that propolis and wax were substances differing in their nature and composition. Subsequent researches, however, have induced us to dissent from that opinion, and to consider propolis as nothing more than wax, only in a more rough and less elaborated state. It is, however, mentioned in the writings of the ancient naturalists, particularly Pliny, that the bees cover the place on which they begin to construct their combs, with a substance which

* See Chapter XX. on the nature of Propolis.

was called *commosis,* on the first layers of which, they spread a second plaster of a weaker consistency, which was called *pissoceros.* These two layers, being smoothened and hardened, the bees then apply the propolis, which, according to Pliny is less viscous than the two former mentioned substances, and possesses a greater affinity with wax. Rejecting altogether the existence of those substances, we consider ourselves warranted from the result of our experiments, to affirm that the bees, whether in the foundation or construction of their combs, make use of no other substance than wax.

On the bees leaving the parent hive, they are provided with all the means necessary for the construction of their combs. The farina of the flowers is found amongst them in all its various stages, from the crude state in which it is gathered from the flower, to its unelaborated and undigested state in the stomach of the bee. Convinced as we are that pollen is the constituent principle of wax, and as we shall state the grounds of that conviction in the chapter on wax, we shall pass over the statements of Huber and others, which is, that the bees bring with them from the parent hive the wax ready made for the construction of the combs, and that the wax so made is to be found under the rings of the abdomen.

The bees always begin to construct their combs at the top of the hive, and if the swarm be a first one, always in the middle, if a second, generally at the side. To the curious observer, the bees appear in the middle of the hive in a large group, apparently in a state of complete idleness. Let, however, a few of the outside bees be removed, and a beautiful white comb will present itself to the view; but in regard to the manner of its construction, the bees appear resolved that no accurate information shall be obtained from them. Huber has, it is true, given us a description of a bee forming a cell from its very foundation to the completion

of it; but we treat the whole account of the transaction as a barefaced fiction, for no man ever yet beheld a bee construct a cell, and we predict never will.

The ovarium of the young queen on leaving the parent hive is full of eggs, and it is therefore necessary that a receptacle should be immediately provided for their deposition; indeed we have known eggs to be deposited in a cell twelve hours after the hiving of the swarm. The queen never lays her eggs but in the middle combs, and although a departure from this principle appears to exist in the case of second swarms, yet, on examination, it will be found that the first comb which is constructed by a second swarm is still the middle comb of their edifice. The direction of the combs is always perpendicular, and parallel with the entrance of the hive; and on the first inspection, it appears wonderful how so delicate and fine a piece of workmanship can sustain the weight of a swarm of bees. On a closer examination, however, it will be found that the bees do not attach themselves to the comb, but to the top of the hive; and that in fact, there is little or no weight really hanging to the combs. The architecture of the bee is in every respect so perfect, that no fear whatever ought to be entertained for the solidity of their works; the foundation of them is, what may be termed a strong viscous glue, and as the combs progress in size, they become regularly attached to the sides, which obviates all danger of their falling. It is however for the purpose of removing this danger, that the cottagers affix the sticks in the hive, which certainly act as a support, but when the hives are to be deprived of their stores, these sticks become a most intolerable nuisance.

It is scarcely possible to conceive a more beautifully attenuated substance than the cell of a bee. The sides of fifty cells laid upon each other would not make the thickness of a common wafer. To each of the cells there is a border which strikingly demonstrates the beautiful symmetry and

architectural skill of the edifice of the bees; for were not the cell furnished with this border, it would not retain the honey. As it has a slight projection over the cell, it can be entirely filled with honey, which on taking the convex form is covered over with a pellicle of wax, that prevents the admission of all air, enables the bees to march over the combs without injuring them, and protects the honey from all humidity.

In regard to the number of cells which are in progress of construction at the same time, it is impossible to fix upon the precise one; and as each comb is composed of a double row of cells formed on a common base, it follows of course that the works must progress equally on both sides, or in a very short time, they would become irregular and deformed. A space is always left between the combs sufficiently wide to admit the passage of two bees, and some persons have pretended to see channels or streets passing horizontally through the combs; but we never yet observed any interruption in the construction of a comb that was not caused by some artificial obstruction, which the bees could not surmount.

The shape of the cells of the bees is a perfect hexagon, with the exception of the drone cells, the figure of which is not wholly regular. The figure of the base is a triangle formed of three equilateral lozenges, the four angles of which are so nicely adjusted, that any other lozenge, composed of any other shape, would not yield the same advantage. Samuel König, who lived about the middle of the last century, but whose works were not published until after his death, made use of the analysis of infinite units to solve this problem, which was proposed to him by Mr. Reaumur, and, after the most elaborate calculations, he arrived after all at the mere result furnished him by the bees.

The thickness of the combs varies according to the purpose to which it is to be applied. The combs destined for

the reception of the brood are in general about an inch thick, giving half an inch to the depth of each cell, and about two lines two-fifths to the breadth. The combs which are destined for the reception of honey, and which are always constructed at the sides, are sometimes twice as thick as the brood combs, the depth of the cell being frequently an inch. The cells in which the drone eggs are laid are rather larger, and in the formation of those cells, the bees appear to have an eye to the size of the insect that is to be bred in them, as well as to the number of them which are to be generated. The diameter of the drone cells is three lines and a half, from which it results that twenty of the drone cells will cover a space of five inches ten lines, whilst twenty cells of the common bees will cover exactly a space of four inches.

Well, indeed, may Latreille in his History of Insects, under the article Bees, thus express himself: "In the vast creation of insects, there is no one whose history presents to us such a prodigious number of wonders, as that of the bee. In regard to industry, these insects are the *chef d'œuvre* of the creation; and man himself, so proud of his natural gifts, is in some degree humiliated at the view of the interior of a bee hive. How is it possible to refrain from those transports of admiration in contemplating the bee? This insect, so weak, so small in appearance, working without relaxation in collecting the materials of its habitation, forming them with so much art, and constructing those wonderful edifices, the architecture of which has been the subject of the meditations of the most profound geometricians."

The combs at their first construction are white, but as they advance in age, they gradually lose their original colour, and from yellow, they become, through almost every shade, a deep black; and this change is to be attributed to the interior heat of the hive, and the continual passage of the bees over them. The vicinity of great manufacturing

towns is prejudicial to the whiteness of the combs, for the dense and smoky atmosphere in which the bees carry on their labours, blackens their bodies, and imparts a dingy hue to the combs.

It was supposed by several naturalists, and particularly by l'Abbé della Rocca, that the whiteness of the combs depends upon the peculiar nature and colour of the farina which the bees collect, and the latter naturalist goes so far as to assert that the wax which is made from the farina of the thyme is the purest in its colour. Now in the first place, we never perceived that the bees collected any farina from the thyme, although it is a plant which is extremely rich in honey, and in the second place, although we have perceived the bees carrying in the farina of every shade, from the white to the dingy brown, and which so assimilated with their own colour as to be scarcely perceptible, yet we never could perceive the slightest difference in the colour of the combs. The elaborating powers of the bee convert the pure farina into one uniform colour, which is white, and whatever may be asserted by certain foreign naturalists, a yellow comb was never yet made by the bees.

For a further elucidation of the nature of the combs, we must refer our readers to the chapters on wax and propolis.

FIFTEENTH CHAPTER.

ON THE BROOD OF THE BEES.

THE COMMON BEES ENDOWED WITH THE INSTINCT OF KNOWING THE TIME WHEN THE QUEEN WILL BEGIN TO LAY HER EGGS—ARRANGEMENT OF THE EGGS IN THE OVARIUM OF THE QUEEN—ADVANTAGE OF THE ARRANGEMENT—THE QUEEN ON LAYING HER EGGS ATTENDED, ACCORDING TO HUBER, BY A BODY GUARD—OFFICES PERFORMED BY THE BODY GUARD—MANNER OF LAYING THE EGGS BY THE QUEEN—THE EGG HATCHED IN THREE DAYS—PROGRESS OF THE WORM TO MATURITY—METHOD ADOPTED BY THE YOUNG BEE TO EXTRICATE ITSELF FROM THE CELL—CONDUCT OF THE OLD BEES TOWARDS THE YOUNG ONE—THE IRASCIBILITY OF THE BEES, THE CRITERION OF THE QUANTITY OF BROOD IN A HIVE—QUESTION DISCUSSED AS TO THE NATURE OF THE FOOD ADMINISTERED TO THE LARVÆ—VARIOUS OPINIONS CONCERNING IT—NO FOOD WHATEVER IS ADMINISTERED TO THE LARVÆ—OPINION OF DUCOUEDIC ON THE SUBJECT—HYPOTHESIS OF HUBER—ITS PRINCIPLE INVESTIGATED—THE ADMINISTRATION OF FOOD TO THE LARVÆ ACKNOWLEDGED BY SEVERAL WRITERS—ITS PHYSICAL OBJECTIONS CONSIDERED—BEE BREAD OR THE POLLEN SUPPOSED BY SOME NATURALISTS TO BE THE FOOD ADMINISTERED TO THE LARVÆ—OBJECTIONS TO BEE BREAD FORMING ANY PART OF THE FOOD—VARIETY OF OPINIONS AS TO THE NATURE OF THE FOOD—VARIETY IN THE COLOUR OF IT ACCORDING TO HUBER, LOMBARD, DUCARNE, AND OTHERS—GENERAL REMARKS.

THE working bees appear to be endowed with the singular instinct of foreseeing the time when the queen bee ought to commence the deposition of her eggs, and also of knowing the number which she will lay. They seem to know that the eggs of the working bees will be laid the first, those of the drone the next, and lastly the eggs of the queen. It is according to this regulation, that the eggs are grouped in the ovarium of the queen, for were it otherwise, and were the eggs from which the queens are to spring to be laid the first, the queens would be born before there were a sufficient number of bees born to compose a swarm, and thus confusion and disorder would prevail in the hive, on account of the residence in it of a number of young queens, who might presume to take upon themselves all the offices and functions of the legitimate monarch, which, being contrary to the apiarian constitution, might lead to an open rebellion,

or, if Huber is to be credited, to a number of duels, which might ultimately leave the hive without any monarch at all.

In the laying of her eggs, the queen is said by Huber to be always attended by a body guard, who perform the most menial offices for her, and even, according to his *ocular* observation, carry her majesty pickapack, whenever she is likely to succumb under her extraordinary fatigue. They further invigorate her at stated periods with a copious supply of honey, and as the body of her majesty becomes defiled by protruding it into the cells for the purpose of laying her eggs, the guards hasten to lick and cleanse her majesty of all her impurities, which appears to impart a high degree of pleasure to the royal person. Leaving this fanfaronade of Huber to the gratification of those, who have a strong digestion for absurdities, we shall simply state, that the queen bee lays her eggs, totally inattentive of every thing that is passing around her, and wholly absorbed in the important business in which she is engaged. Frequently, she enters a cell with her head foremost, in which position she remains for an instant, and then either passes to another cell, or enters it backwards, when the deposition of the egg takes place. The purpose of her entering the cell with her head foremost is evidently with the view of ascertaining whether an egg has been already deposited in it, and on finding it to be the case, she hastens on to another cell.

At the expiration of three days, the egg is hatched, the produce of which is a whitish worm, which is visible in a circular form at the bottom of the cell, and in this state it is known by the name of *larva*. According to the forwardness or backwardness of the season, the worm or larva grows for five or six days, when it envelops itself in a whitish silky film, in which it takes the form of a chrysalis. In this state the pellicle in which it is enveloped is so delicate and fine, that its six legs can be distinctly seen arranged under its

belly, and the proboscis bent the whole of its length. The chrysalis in this state is of a dusky white, and having attained its full growth, the cell is covered over with a slight film, in which the insect progresses from its nymphal state to the perfect bee. The entire period from the deposition of the egg to the egress of the perfect bee from the cell is about twenty-one or twenty-three days, according to the temperature of the season. In the hottest part of the summer, the birth of the bee has been known to take place in eighteen days, and some naturalists affirm that it has taken place in fifteen, a circumstance, which we can suppose to happen only in very hot climates. The queen bee takes about eighteen days in coming to perfection. These developments, however, are slower or more rapid in one hive than another, according to the forwardness or backwardness of the season, or the greater or less population of the hive.

On the young bee arriving at maturity, it makes use of its forceps or teeth to liberate itself from its confinement by biting through the pellicle of wax with which the cell is covered. This is, however, to some bees a task not very easy of execution, and many die in the operation, especially if the weather be cold. In this respect, there appears to be a deficiency in the instinct of the bee, which under almost all other circumstances is so prominently displayed; whilst the young bees are struggling to effect their emancipation, the old bees appear to take not the slightest notice of them; but they have no sooner emerged from their cells, than the old bees flock around them, cleaning them with their proboscis of any extraneous matter, which they may have brought with them from the cell, and so eager do the bees appear in the exertion of this part of their duty, that to the casual observer it would seem as if they were grossly maltreating their new companion, for two or three of the bees pounce upon him at once, turning him about in every direction, whilst the new-born insect cleans its antennæ with its

forefeet, and seems delighted with the attention that is paid to it. This action of the bees arises from a greediness to partake of the saccharine matter which adheres to the body of the young bee on its emerging from the cell, but the origin of which has baffled the naturalists to discover.

The greater or less quantity of brood in a hive may in a great degree be calculated upon by the proportionate irascibility of the bees. A fertile queen will always be supported by an extraordinary degree of activity and industry on the part of her subjects; whereas they seem to think a weak and impotent queen scarcely worth defending or working for. The bees which show no tokens of anger on any annoyance being offered them, have some internal cause to dispirit them, and, in general, it arises from the weakness or barrenness of the queen. When the internal economy of the hive is in a good and regular state, when the ovipositing of the queen proceeds in a prolific manner, and the population of the hive is on the increase, then the least encroachment upon their territory rouses the anger of the bees, and they display all their native virulence and spirit.

It has been a matter of great dispute amongst naturalists as to the nature of the food, with which the larvæ of the bees are fed. Some have considered it to be pure honey, others a mixture of honey and farina, and Huber determines it to be a compound of some sort, but the materials of which he confesses that he knows nothing about, nor can he tell whence the bees procure it. At one time, it is a concoction of their own making; at another, it is *a something* that they collect amongst the flowers, the whole nature of which is as miraculous and inexplicable, as the royal jelly itself. We confess that we were originally inclined to the opinion that food of some kind was administered to the larvæ of the bees, and we expressed ourselves to that intent in the first edition of our treatise on the management of bees; but subsequent researches, supported by the experience of

others, particularly of Mr. Ducouedic, have confirmed us in the opinion, that no food whatever is administered to the larvæ. Huber, however, and we quote his own words, considers that the following deductions are perfectly consistent with the principles of sound logic. We have however always been taught to consider it as one of the axioms of logic, that if the premises be false, the deductions must be false also; and therefore Mr. Huber, before he called upon us to admit his conclusions, should have first convinced us of the truth of his premises. *We know*, he says, that a particular kind of aliment is conveyed to the royal cells, whereas, in fact, we do not know any such thing, but we do know the exact contrary. Huber informs us that the jelly makers place the aliment not only *before* the mouth of the larva, but also around its body; from which we were led to expect that the worm or larva, floating in a kind of nutritious menstruum, might, perhaps, by a particular operation of nature absorb the vivifying principles, without any part of the aliment being submitted to the elaboration of the digestive organs. In this calculation, however, we found ourselves deceived, for Huber informs us, that the larva, being able to move only in a spiral direction, keeps incessantly turning to take the jelly deposited *before* it. This is all very plausible, provided Mr. Huber had succeeded in convincing us, that the insect ever moves at all, which we hesitate not most positively to deny, for the larva of the bees appears to be divested of all power of locomotion, lying at the bottom of the cell in the form of a small maggot. It then assumes the nymphal state, when it takes an horizontal position, in which it remains until it emerges from the cell. The motion of the larva in a spiral direction at the time when the royal jelly is administered, is one of the least happy of Huber's fictions; but even granted, that the larva does move in that direction, so as to be able to imbibe the jelly, which is placed *before* it, in what direction must it move to imbibe that, which is placed *around* it? It must be able

to place its body in every possible curve; but this is rendered impossible by the very construction of the cell, and therefore it is left to our own ingenuity to solve the problem in the best way that we are able.

We admit that it is not Huber alone, but the majority of writers on the natural history of the bee, who speak of the administration of food to the larvæ as a settled and indisputable point; we, however, profess ourselves to be decidedly sceptical as to the administration of any food, from the moment of the hatching of the larva, to the final envelopment of the nymph in its cocoon. The larva passes regularly through all the stages of its growth without any aid or assistance from the bees; nor is there any required, in order to enable it to complete its full development; and granted, that we were to admit the fact, that food is administered to the larva, the question then arises, in what manner is it imbibed by it? The proboscis is not yet formed, its digestive organs are in a state of embryo, it is in fact in a state of positive inertness. We admit that analogically considered, we ought to bestow our assent to the hypothesis of the administration of food to the larvæ of the bees, for the worms of the silk worm, as well as of almost all of the phalenæ tribe, are nourished by food immediately on bursting from the eggs; but the very power of locomotion, with which the worms of the moth tribe are endowed, constitutes the most essential difference between them and the larvæ of the bees, and is in itself a tacit implication, that no food whatever is required to support it through the different stages of its growth.

It has been asserted by some apiarians that bee bread, or the pollen of the flowers, is the food which is administered to the young; but so far from that substance being gathered as the food of the larvæ, we can affirm that, under no circumstances whatever, is it applied to that purpose, nor does it, under any modification whatever, form a part of the food of the bees. Honey is their only natural food, and

although they possess the power of regurgitation, yet we never experienced a single instance in which honey was regurgitated into a cell, in which there was an existing worm. Rather than consume a single particle of bee bread, they will die with hunger; and in proof of that assertion, we will challenge any person whose hive has perished during the winter for want of food, to deny that in a hive so circumstanced a superabundance of bee bread was to be found; and in fact, it generally happens that the bee bread predominates in those hives, which are found to be deserted by the bees, or which have perished for want of food.

Amidst this contrariety of opinion, it is perhaps of all circumstances the most singular, that amongst the numerous advocates for the administration of food to the larvæ, not one of them has been able to determine what that food is. One affirms it to be honey, another honey and water; a third, a mixture of honey, farina, and water; a fourth, a particular and unknown substance collected by the bees; and a fifth, a kind of liquid designated as royal jelly, which is manufactured by a particular species of bees, and the extraordinary potency of which has been already fully detailed. Further, it is not only the substance itself, but the very colour of it, respecting which, scarcely two of them agree. Huber declares it to be white, Lombard affirms it to be yellow, Ducarne asserts it to be of a golden colour; and all of them again differ as to the taste of it; by one of them it is said to be sweet, by another that it is acrid, by a third that it is highly pungent, and by a fourth that it is wholly insipid; from all of which we draw the conclusion, that had any food been ever seen in a cell, such a contrariety of opinion could not possibly have existed; and that the total want of unanimity as to its real nature and character is almost an incontrovertible proof that no food whatever is administered to the larvæ.

SIXTEENTH CHAPTER.

THE MALADIES OF BEES, THEIR CURE AND PREVENTION.

THE DYSENTERY AND INDIGESTION, THE PRINCIPAL MALADIES OF BEES—SUFFOCATION MENTIONED BY THE FRENCH APIARIANS—THE PROTRACTED RETENTION OF THE FÆCES THE CHIEF CAUSE OF THE DYSENTERY—PERIODICAL FLIGHTS OF THE BEES—ERRORS OF THE FRENCH NATURALISTS—ERRONEOUS STATEMENT OF MR. DUCOUEDIC—ANECDOTE OF THE DUCHESS OF ST. ALBANS (NOTE)—INVESTIGATION OF THE HYPOTHESIS OF DUCOUEDIC—THE DRONE VOIDS NO EXCREMENT ACCORDING TO DUCOUEDIC—HIS FOOD CONVERTED INTO WAX—REFUTATION OF THAT STATEMENT—THE CHIEF SYMPTOMS OF THE DYSENTERY—THE MALADY CONTAGIOUS—A SPURIOUS AND CORRUPTED FOOD, ONE OF THE CAUSES OF THE DYSENTERY—SUPPOSED TO BE PRODUCED BY PARTICULAR TREES AND FLOWERS—EXPERIMENT OF REAUMUR—VARIOUS REMEDIES PRESCRIBED FOR THE DISEASE—EXCELLENT RECIPE FOR THE CURE OF IT—SINGULAR ADDITION MADE TO IT BY MONSIEUR MARTIN—REMEDY PROPOSED BY WILDMAN—PARKYNS, LOMBARD, RANCONI, JAIME GIL, DUCHET, KEYS, L'ABBÉ BIEN-AIMÉ—THE DYSENTERY ALMOST INCURABLE IF NOT TAKEN AT ITS ORIGIN—THE STAND TO BE FREQUENTLY CLEANED—INDIGESTION OF BEES—COARSE SUGAR ONE OF THE CHIEF CAUSES OF IT—THE ANTENNÆ OF THE BEES SUBJECT TO A DISEASE—ITS SIGNS—ATTRIBUTED BY MR. DUCOUEDIC TO THE FARINA OF THE BROOM—ABORTIVE BROOD THE CAUSE OF THE DEATH OF A NUMBER OF BEES—SIGNS OF ABORTIVE BROOD—COMBS CONTAINING ABORTIVE BROOD TO BE CUT OUT—ABORTIVE BROOD THE SIGN OF THE DECLINE OF A HIVE—BEE BREAD FORMERLY CONSIDERED A DISEASE.

THE two principal maladies of the bees are the dysentery and indigestion, although the French apiarians include suffocation as a very common one. In regard to the former, a variety of opinion has been held as to the cause of it, and consequently the remedies differ with the cause. The protracted retention of the fæces is undoubtedly the chief cause of the dysentery; for in a healthy state, the bees never emit any fæces in the hive; and therefore they take the advantage of a day on which the sun shines brightly to leave the hive, circling the air in numbers, similar to the departure of a swarm, during which time the excrement is voided, as can be verified by any one standing in the immediate vicinity of the hives during the periodical flights of the

bees; when he will find his clothes studded with small spots of a thickish, yellowish colour, and emitting rather an unpleasant smell. Should however the bees be confined to the hive, either by an erroneous system of management or a long continuance of bad weather, the accumulation of the fæces in the intestines of the bees produces that disease which is known amongst them as the dysentery, and is the cause of the destruction of many hives.

If however we consult the writings of the French naturalists on the subject of the diseases of bees, we cannot but be forcibly struck with the extraordinary errors into which they have fallen, and which almost warrant the conjecture, that the works of several of the French apiarians are merely crude compilations, and not based on the results of personal experience. We know Mr. Ducouedic to have been a naturalist, to whose authority great deference has been paid on all matters relative to the natural history of the bee; yet how grossly has he erred when he asserts that the bees void no excrement at all, and that they are even destitute of the organ necessary for its emission. "Every thing," he says, "which enters into the body of these insects for their nourishment is never emitted by any other channel than the mouth, and is converted either into honey, wax, or propolis. When the bees are afflicted with the dysentery, it is then *even by the mouth* that they disgorge the substance, which has been corrupted in their stomachs, instead of being converted into one of the above mentioned three substances."

We should have considered the foregoing statement of Ducouedic as totally unworthy of all notice, as it is in direct variance with the most limited experience, had it not been incorporated by some of the encyclopedists of this country, into the natural history of the bee, and advanced as incontrovertibly true. Had Mr. Ducouedic taken upon himself the task of dissecting a bee, he would immediately have discovered the fallacy of his statements; and moreover, had

he stationed himself in the immediate proximity of his hives during one of the periodical flights of his bees, he would have seen in numerous instances the fæces pendent to the extremity of the abdomen of the bee, showing itself in a long viscous thread, which the bee appears unable to detach from its body; and further, on watching the bees alight on the pedestal of their hive, he would have witnessed the excrement in numerous instances falling from their abdomen in the shape of small linseed, and varying in colour from a muddy yellow to almost a dark brown *.

Ducouedic, however, not satisfied with one error, which he had promulgated, appeared determined to outdo himself by the dissemination of a still greater; for he says the drone, who has no sting for its defence, never voids any excrement. The new food which it imbibes *is converted into wax* in its second stomach, and is disgorged by the mouth. The opening which is observed in its posterior extremity is nothing more than the orifice of the sheath of the organ proper for the fecundation of the eggs of the queen; even the queen herself never emits any excrement. The orifice of the organ which is perceived at her posterior extremity, is merely for the purpose of the deposition of her eggs.

It would be scarcely possible to select a passage in the writings of any naturalist, with the exception of Huber, in which a greater number of errors are to be found than in the one preceding. It is agreeable to every-day experience that the drone voids his excrement the same as the common bees, and this act is performed during the time

* The mother of the present duke of St. Alban's was very partial to the culture of the bee, and she possessed a small apiary at Gatton near Reigate. It was during one of our visits to that place, that whilst we were standing with her grace before the hives, the bees took one of their wintry excursions, emitting their fæces, as they circled around us; when in a very short time an elegant velvet dress, which her grace wore at the time, was so studded and defiled by the excrement of the insects, as to be totally spoiled, arising from the gluey viscous nature of the fæces, which could not be wiped off, without leaving a great stain behind it.

that the drone takes his excursions in the air, which is generally from about eleven to one; and it is rather singular, and forms a striking proof of the contradictions and paradoxes into which the numerous historians of the bee have fallen, that Huber mistook the excrement of the drone for the seminal fluid, and on that mistake he founded his system of the impregnation of the queen by the drone in the open air. The most extraordinary error, however, into which Mr. Ducouedic has fallen is, that the food imbibed by the bee is converted into wax, and disgorged by the mouth, which is tantamount to saying that wax is the excrement of the bee; for Ducouedic would not dare to lay such a heavy tax upon our credulity, as to assert that the drone made any use of the wax. We are, however, in some degree indebted to him for his tacit avowal of the manner in which wax is made by the bee, which is exactly conformable with the description which he gives of the conversion of the food, imbibed by the drone, into wax in the second stomach and *disgorged by the mouth.*

The following may be considered as the chief symptoms of the dysentery. When the bee-master examines his hive, and perceives on the platform or at the entrance of the hive large spots, like linseed, of a colour approaching to black, and of an offensive smell; if the combs appear to be streaked with dark lines, as if some feculent fluid had run down them, the prevalence of the dysentery is then confirmed. It has been asserted by several apiarians that the dysentery is contagious, and that the bees of one hive will communicate the malady to those of another; we however conjecture that this opinion has arisen from the circumstance, that several hives of the same apiary have been affected with it at the same time; the real cause of which most probably was, that the bees of all the infected hives became subject to the same malignant influences, and consequently were subject to the same disease. The

bees when labouring under the dysentery are unable to retain their excrement, the atmosphere of the hive becomes consequently vitiated by the offensive odours issuing from the excrement, the whole community are then living in an infected air, and the malady spreads itself, until the bees gradually dying off, the hive becomes wholly depopulated. Another cause of the spreading of the disease is, that the bees drop their excrement upon one another, defiling their bodies, clotting their wings with a viscous, noxious matter, impeding the organs of respiration, and thus gradually reducing their number until the necessary temperature of the hive can be no longer maintained; a general weakness seizes the whole community, and in the midst of this calamity the queen perhaps falls a victim to the disease, and the bees leave their infected hive as a prey to their numerous enemies.

A corrupted and spurious food has been considered by some apiarians as the cause of the dysentery, and by others it has been attributed to the honey collected by the bees from particular flowers and trees, amongst the latter of which are classed the elm and the lime, than which nothing can be more erroneous; for in the first place, the flowers of the former tree yield little or no honey, but an abundance of farina, whilst the flowers of the latter are known to yield the bee a rich and excellent harvest of honey; so much so, that it is become almost proverbial:—

> "Where limes abound the bees in plenty live,
> No better honey can a blossom give."

An experiment tried by Reaumur has frequently been quoted as confirmatory of a particular kind of food being the cause of the dysentery, but in the general calculation of the result of that experiment, the real cause of the malady has been overlooked, and it has been attributed to one, which it is most probable had not the slightest relation with

it. It appears that Reaumur kept the bees of a particular hive *in a state of confinement,* during which time *he fed them entirely on honey;* the bees were attacked by the dysentery, and the cause of the disease was attributed to the food; wholly passing over the real one, which was the confinement of the bees, and their consequent inability to vent their excrement exteriorly to the hive. Nevertheless, as the kind of food with which the bees were fed had been declared by so great an authority as that of Reaumur to be the cause of the disease, no further investigation was deemed necessary; accordingly, the ruinous custom of confining the bees was persevered in, and although the death of a number of hives ensued, the food was said to be the sole cause, and the consumption of bee bread by the bees came in for its share of the blame, although no bee ever partook of it as an article of food.

Various remedies have been prescribed for this disease, which is certainly curable, if taken at its commencement, but if suffered to reach a particular height, all attempts at a cure become useless. We have found the following composition to be highly efficacious at the first exhibition of the disease, for it not only has a tendency to strengthen and invigorate the bees, but acts as a laxative upon them, and thereby forces them to void those noxious substances, which have become corrupted in their bodies, and been the primary cause of the disease.

Take a quart of old wine, a pint of honey, and two pounds and a half of moist sugar, with a small table spoonful of salt; boil the whole gently over a slow fire, skimming it frequently, until it be reduced to the consistency of a syrup. It may then be put into jars, and kept in a warm place, and used as the occasion may require. M. Martin, who copied the above recipe from our "Cottager's Manual for the Management of his Bees" and which he inserts in his "*Nouveau Manuel complet du Propriétaire des Abeilles,*"

recommends the addition of a portion of wax, for the purpose of giving a proper degree of consistency to the mixture; the advice, however, is highly injudicious. The process of ebullition will impart a sufficient degree of consistency to the liquid, and wax is of all substances the last, which should be introduced into the food of the bee, whether naturally or medicinally.

Wildman recommends the sprinkling of common salt well pounded on the stand. The advice may be founded on good judgment: but on the same principle, that although a horse may be taken to the water, it does not thence follow that he can be made to drink; so the mere sprinkling of the salt on the stand of a hive is no guarantee that the bees will eat it; in fact, we are convinced that no food can be medicinally imparted to the bees, that is not disguised by some saccharine matter. Mr. Parkyns, a barrister, recommends the salt to be dissolved in water, but by what means are the bees to be compelled to imbibe the medicine presented to them? Salt is no doubt highly salutary to bees, but it is only in a state of health that they will partake of it.

Mr. Lombard recommends a curious remedy, but it is in perfect character with the majority of his Huberian conceits, and it is not the only one of his remedies that ends in smoke. Fumigation may be considered as the hobby horse of Mr. Lombard, and although in some of his transactions with his bees it is undoubtedly of great efficacy; yet we consider it in the cure of the dysentery in the bees, which is an internal malady, as possessing not the slightest virtue. Mr. Lombard takes an earthen or iron vessel in which he puts some live coals, and sprinkles over them some linen rags, dried leaves, or pieces of dried calf's dung. The more profuse the smoke, the more certain the remedy, and when the smoke is at its height, the hive is gently raised, and the vessel placed under it. According to the dictum of Mr.

Lombard, he never knew this remedy to fail; on the other hand, we never knew it to succeed. We have fumigated our bees almost to positive suffocation, and in regard to the extinction of the disease, not the slightest progress was made. It is certainly beneficial to the bees, as completely changing the infected air of the hive, and as a preventive is undoubtedly worthy of adoption; but as a remedy, without an entire change of food, it is wholly inefficacious.

Mr. Ranconi recommends the placing of small plates in the vicinity of the hives, filled with fresh urine. This remedy is still more objectionable than the pounded salt of Wildman; for in what manner are the bees to be brought out of the hive to partake of the medicine, which is prepared for them, exteriorly to it? We have frequently experienced great difficulty in inducing them to descend from the combs to partake of the food deposited for them on the stand; how much greater therefore must it be to bring them to leave the hive, especially when they are greatly debilitated by the effects of the disease. In default, however, of the bees making use of the urine, Mr. Ranconi recommends the administration of the following compound. Boil some old sweet wine with an adequate proportion of sugar, to which add some cloves and nutmegs and some dried rose leaves. The bark of pomegranates well pounded and sifted, and mixed with honey and sweet wine, has been found very conducive to the health of the bees.

The bark of the pomegranate is out of the reach of the English apiarian; but without entering upon the question of its efficacy, we attach little or no value to any prescription for bees, the ingredients of which are of a crude and solid nature. Jaime Gil, a countryman of Ranconi, recommends half a dozen cloves of garlick to be given to the bees, but he forgets to inform us at the same time of the means by which the bees are to be made to eat the garlick. Pierre Constant Lengrois, who wrote his "*République des*

Abeilles" in 1583, strongly recommends a decoction of *sweet* herbs, in which the root of the *leek* is to predominate. Mons. Gil informs us, that *if* the bees can be brought to partake of this liquid, the *cure is certain.*

Mr. Duchet in his treatise on bees asserts that the dysentery generally proceeds from a deficiency of food, and particularly in the spring when there is no honey in the fields, and the bees are reduced to the necessity of *eating the farina of plants,* and *drinking snow water.* Duchet was in many instances a very excellent practical apiarian, but he must have known that no necessity whatever can induce the bees to partake of the farina of plants as their food, and secondly, that the drinking of snow water is certainly a very possible contingency, but not a very probable one.

According to the suggestion of Mr. Keys, the diseased hives should be taken as soon as discovered into a warm room, and the parts of the combs which are black and mouldy cut away. The recommendation of this plan is one thing, the execution of it another. If the bees be in the common straw hive, the extraction of the mouldy combs is a task, that few would be inclined to undertake, and still fewer would be able to accomplish; nor can we conceive what possible effect the operation of cutting out a few musty combs can have upon the stoppage or cure of an internal malady. Keys, however, is in general so very deficient in his general knowledge of the natural history of the bee, that it is by no means surprising that he commits an error in prescribing a remedy for a disease, of the nature of which he is wholly ignorant.

L'Abbé Bien-Aimé, in his memoir on bees, recommends oatmeal to be given to the bees, the efficacy of which we consider to be as great as oysters to a horse for the glanders. Had the worthy Abbé been born north of the Tweed, our surprise at the recommendation of the oatmeal might not

have been so great; but it must have been a most fanciful conceit to suppose that the bees would so far depart from their nature as to eat a farinaceous substance whilst labouring under a particular disease, which in a state of health would be directly obnoxious to them.

From these various remedies, differing however considerably in their component parts, it might be supposed that *one* could be selected of such tried efficacy, as to be able to stop the ravages of one of the most formidable diseases to which the bees are subject. Such, however, is not the case, for the malady appears in general to baffle every remedy that is applied; and rather than attempt the hopeless task of a cure, we consider that it would redound more to the benefit of the proprietor to suffocate the bees at once, and take possession of their honey before it be rendered useless by the excremental matter of the bees.

Cleanliness may contribute greatly to check the progress of the disease, for which purpose the stand should be frequently cleaned and washed with salt and water, or chloride of lime. It must be evident that the accumulation of the infected fæces on the stand must aggravate the disease; independently of which, the cleansing of the stand is the means of renewing the air in the hive, and dispelling that humidity, which by generating a quantity of foul air is so prejudicial to the health of the bees.

The indigestion of bees is generally caused by the administration of a gross and corrupted food; but when they subsist on the mere produce of the hive, it is a disease with which they are seldom afflicted. Amongst the substances administered to the bees as food, there is perhaps no one more likely to bring on indigestion than common coarse sugar, and especially if the bees have no water at hand with which to dilute it. It becomes a kind of granulated substance in their stomach, which the digestive organs cannot receive, and the death of the insect is the consequence.

This is, however, a malady the more dangerous, as there are no signs exhibited by which it can be known. The pedestal is covered with the bodies of the dead; and the proprietor draws the conclusion, that the bees have died of old age, or been murdered by their companions.

The antennæ of the bee are subject to a disease, but it is of so rare an occurrence, and has fallen so little under the notice of naturalists, as to be scarcely worthy of notice. It is known by the extremities of the antennæ assuming a yellow colour, with a slight swelling, similar to the bud of a flower just ready to burst. It however frequently happens, when the bee has been working upon those flowers which are rich in farina, that its antennæ and even its whole body will be covered with a kind of golden dust; and we are not quite certain, when Mr. Ducouedic attributed the disease to the farina of the broom, which is one of the richest of all shrubs in that substance, that he did not mistake a natural effect for the symptoms of a disease, and which always shows itself when the labours of the bee are at their height.

The abortive brood, although it cannot be classed amongst the actual diseases of the bees, yet it may be regarded as the cause of the death of a number of bees, if not the ruin of many hives, as it engenders a corrupted air in the hive, which is highly injurious to the bees. The signs of abortive brood are very easy to be distinguished, for when the brood is in a healthy state, the top of the cells presents a convex appearance; but when the contrary is the case, the top has, as it were, fallen in, and is concave and of a blackish hue. It is by no means an uncommon sight to see a bee dragging out an abortive nymph; at the same time, it is not the sign of a prosperous hive, when the bees are seen to drag out many of them. It has been recommended by some apiarians to cut out the combs in which the abortive brood is known to exist; and this recommendation would be good, provided it could be carried into execution; but how can a few cells

be cut of a comb without endangering those which are contiguous to it, and which may actually contain good and wholesome food. The better plan is to leave the operation to the bees themselves, who will not allow a corrupted nymph to remain in a cell, if they can drag it out. We advise the apiarian to keep a vigilant eye upon the hive, from which the bees are seen to drag the abortive nymphs, for either some radical defect exists within, or the hive has begun to decline.

Bee bread was formerly considered as partaking of the nature of a disease, owing to the erroneous opinion being circulated by so high an authority as Hunter, that it was the excrement of the bees. A superabundance of it is certainly injurious to the bees, as it occupies those combs which might be filled with either honey or brood; but as to any positive injury occurring to the bees from its existence, there are no proofs extant.

SEVENTEENTH CHAPTER.

COMPARATIVE ADVANTAGES OF DEPRIVATION AND SUFFOCATION.

DISCUSSION OF THE QUESTION OF DEPRIVATION AND SUFFOCATION—THE PROCESS OF DEPRIVATION APPARENTLY OF A FORMIDABLE NATURE—BEES EASILY TAMED BY SMOKE—HIVES TO BE WEIGHED PREVIOUSLY TO DEPRIVATION—THE WEIGHT NOT ALWAYS THE CRITERION OF THE QUANTITY OF HONEY—COMPARATIVE WEIGHT OF CELLS FILLED WITH BEE BREAD AND WITH HONEY—WEIGHT OF HONEY TO BE TAKEN FROM A HIVE IN SUMMER OR WINTER—THE PROCESS OF DEPRIVATION ALWAYS TO BE PERFORMED IN THE EVENING—METHOD OF DEPRIVATION—THE STICKS PLACED IN A HIVE THE CHIEF OBSTACLE TO DEPRIVATION—THEIR OMISSION STRONGLY RECOMMENDED—PRECAUTIONS TO BE USED IN RETURNING THE HIVE TO THE PEDESTAL—METHOD OF DEPRIVATION WITHOUT SMOKE—ITS DANGER AND TEDIOUSNESS—DEPRIVATION IN THE HUISH HIVE—INSTRUCTIONS FOR RESTORING THE BEES TO THE HIVE—DEPRIVATION BY PLACING SMALL HIVES OVER THE LARGE ONES—TWO SEASONS OF DEPRIVATION—SPRING DEPRIVATION RECOMMENDED—SUPPOSED TO PREVENT THE BEES FROM SWARMING—ERROR OF THAT SUPPOSITION—A HIVE NOT TO BE DEPRIVED ON BOTH SIDES—METHOD OF DEPRIVATION ACCORDING TO VARRO AND COLUMELLA—SUFFOCATION GENERALLY ADOPTED IN THIS COUNTRY—SUFFOCATION STRONGLY ADVOCATED BY M. LA GRENÉE—EXPOSITION OF HIS SYSTEM—CALCULATION OF THE PRODUCE OBTAINED BY SUFFOCATION AND DEPRIVATION—QUANTITY OF HONEY OBTAINED BY DEPRIVATION (NOTE)—DEPRIVATION PREFERABLE TO SUFFOCATION.

THERE is no species of stock which produces so great a profit with so small an outlay as bees, and the question then arises, in what manner can that profit be rendered the greatest, whether by depriving the hives of their superfluous store, or suffocating them at the end of the season? This question has been discussed by almost every apiarian, particularly the French; and whilst each system has met with its enthusiastic advocates, the one supported by humanity, the other by prejudices and antiquated customs, we find that the question stands nearly as it was at the commencement, in an undetermined and unsettled state. We have met with many bee masters, who, on the score of humanity,

showed themselves most anxious to adopt the system of deprivation; but who were actually deterred from it by the almost insuperable obstacles with which deprivation is attended in the common cottage hive. To contend with a few thousands of infuriated insects appears to be an act nearly allied to madness, when the same if not a greater share of profit can be obtained by a halfpenny-worth of sulphur. We therefore consider it utterly hopeless to introduce the system of deprivation into this country, so long as the common straw hive is in general use.

The process of deprivation appears at the first view to be one of a most formidable nature; but it is in reality not so much so as it seems to be. The operator has always in smoke a most powerful auxiliary, by which he can in a moment quell a hive of bees, in the utmost state of irascibility; and with this potent aid at hand, the most timid person may fearlessly extract the combs even from the cottage hive. The following is the process to be adopted. The first point is to ascertain the weight of the hive, from which a correct estimate may be formed of the quantity that can with safety to the bees be taken from them. A different calculation, however, is to be observed between an old and a new hive, and the particular season of the year must be taken into the account, in which the deprivation takes place. The weight of an old hive is not always a correct criterion of the quantity of honey, as in all old hives there is a superabundance of bee bread, which is the most ponderous substance in a hive. Take fifty cells filled with bee bread, and fifty cells filled with honey, and the weight of the former compared with that of the latter will be as three to two. If the hive weigh thirty pounds, which is by no means an unusual weight, if deprived in the spring, it can well afford to lose ten pounds, but if in the autumn, we would not recommend more than five to be taken. The operation of deprivation should be always performed in the

evening, when it is supposed that all the bees have returned from their labours; for if performed in the middle of the day, the operator is so dreadfully annoyed by the bees returning from the fields, that he is surrounded by hosts of angry insects, and the whole apiary perhaps put into confusion. The hive must be gently lifted from the pedestal, and placed with the combs upwards on the ground. The entire surface of it will appear a living mass, and the timid operator dreads the consequences which might ensue to him, were only a thousandth part of the insects to wreak their vengeance upon him. Calling, however, to his assistance the fumigating bellows (see page 285), he proceeds to pour upon them a Vesuvian smoke, and, in a moment, the utmost alarm prevails, and the bees hurry to the furthest extremity of the hive in order to protect themselves from such an unexpected nuisance. The absence of the bees will give the operator a full opportunity of examining the state of the combs, and determining on which side to begin the operation. The extraction of the first comb is generally attended with the greatest difficulty; the second is more easily extracted on account of the space which has been left by the extraction of the first. Should the bees show a disposition to be troublesome, repeat the application of the smoke, and their interference will be checked in a moment. In cutting out the combs, particular care should be paid not to cut into two combs at once, but, if possible, to extract one completely, before a second one be cut into. Here, however, steps in the chief obstacle to a clean and expeditious extraction of the combs, which is the sticks that are almost universally placed in the hive, with the intent of keeping the combs from falling. The extraction of a complete comb becomes under those circumstances a direct impossibility. The combs must be cut into pieces in order to disengage them from the sticks; the operation becomes unpleasant and disheartening from the hands being covered

with honey, independently of the great loss which is sustained by it flowing from the combs. In some instances, we have found it impossible to cut out a comb to its very foundation at the top, and the bees then in the hive being returned to the pedestal are literally drowned in their own sweets. We cannot too strenously recommend the omission of these sticks. They are by no means required for the support of the combs, as the bees know well how to give their combs all the support they require, and in all operations connected with the interior of the hive, they are a direct and insufferable nuisance.

The requisite quantity of honey being extracted, the hive may be returned to its pedestal; but it should not at first be placed directly upon it, but let it be supported by a stone or two about an inch from it, whereby the lives of a number of bees will be saved, which would otherwise be crushed between the hive and the pedestal; the supports, however, must be removed the same night, or on the following morning the proprietor will have the mortification of beholding the hive, that has afforded him so rich a harvest, the prey to a host of robbers, who, scenting the honey that has been spilt, will attack it from every quarter.

The operation of deprivation, when the fumigating bellows are not at hand, is one, which we would recommend few persons to undertake. It is one of extreme difficulty and hazard, and in many instances has exhausted the patience of the most enthusiastic apiarian. We will, however, give the description of it for the benefit of those, who may feel disposed to try the experiment.

In the first place, an empty hive must be procured of the exact diameter of the hive which is to be deprived, the full hive being lifted from the pedestal and reverted as before, the empty one is placed over it, and the hives being consolidated, a sheet or a large table cloth must be wrapped round them at their point of junction, in order to prevent

any of the bees from escaping out of the hive. This arrangement being completed, the lower hive is beaten gently with the flat hands, or with sticks, for the purpose of so alarming the bees as to force them to ascend into the upper hive: and now arrives the trial of the patience of the operator. In some instances we have known the bees to ascend in ten minutes or a quarter of an hour, in others we have not succeeded after knocking and thumping for three or four hours; and in some cases, we have been obliged to desist altogether and relinquish it as a hopeless task. The ascent of the bees into the upper hive is to be ascertained by a loud humming noise, which is supposed to be indicative of the queen having ascended into the upper hive; and the bees make known the fact to each other by the expressions of their joy. The under hive being pretty clear of bees, (for it is in vain to hope that all of them will have left it,) it must be taken into some outhouse, during which time the hive with the bees in it may be left covered up with the table cloth or sheet. The process of extracting the combs has been already described, and it having been accomplished in this case, the deprived hive must be taken to its original station and the bees returned to it. In order to effect this, place a stool or chair exactly level with the entrance of the hive, throw the table cloth over the chair, and, holding the hive with the bees on it over it, give it a smart knock, on which the bees will fall upon the cloth. Then guide a few to the entrance, who will begin immediately to vibrate their wings with joy; the whole community will on hearing the welcome sound hurry into the hive, and in ten minutes not a bee will be left on the cloth.

The deprivation in the Huish hive has been already described, and, compared with the operation on a cottage hive, it is one of facility, cleanliness, and expedition. Even the common storifying hive possesses a great superiority over the cottage hive, inasmuch as a portion of the produce

can be taken without molesting the whole community, or suffering any loss from that partial destruction of the combs, which always takes place, more or less, in the cottage hive.

In order however to prevent the suffocation of the bees, and still to obtain a proportionate quantity of their riches, without undergoing the difficult and tedious process of deprivation, let the following plan be adopted. In the month of March, cut off three or four bands of the top of the hive, and place over the orifice a small hive of from four to six inches in diameter. As the honey season approaches, the bees will proceed to construct their combs in the small hive, and by August or September, it will be full of excellent honey-comb, which may be taken away without the least fear of subjecting the bees to famine, as the very act of filling the small hive presupposes that all the cells in the hive are full, and consequently an adequate supply of provisions exists for the winter. One of these small hives will weigh from fifteen to eighteen pounds, and supposing that it fetches at the market only one shilling a pound, which is a very low price indeed for pure white honey comb, fit for the breakfast table or the dessert, it follows that a clear profit of fifteen or eighteen shillings has been gained, and the proprietor is still in possession of his stock of bees; whereas had he suffocated them, the produce might have perhaps been greater by a few pounds of honey, but then the bees would be suffocated, and the most valuable part of his property thereby destroyed.

There are two seasons of deprivation, the spring and the autumn, and each has its strenuous advocates. We, however, strongly recommend the former, on account of the certainty which then exists of the bees being able to replenish the vacuum before the winter sets in; whereas in the autumnal deprivation, the vacuum exists during the whole of the winter, which, on account of the foul and humid air which is engendered, is highly injurious to the bees. It may

indeed happen, that if the deprivation take place immediately after the swarming season, the bees will have time to fill up the vacuum before the winter sets in, but we very seldom knew it to be the case. One of the objections urged against the spring deprivation is, that it is apt to prevent the hive from swarming, and we admit that there is some validity in the objection ; but an isolated case ought not to operate to the injury of a whole system, for although it may happen in particular cases that the deprivation will prevent the swarming, yet as it cannot be urged as a general principle, a great part of the objection is thereby rendered invalid. On the other hand, the great objection to the autumnal deprivation is, that the proprietor, from an over greediness to obtain a considerable booty from his bees, is apt to take more than he ought to do, and consequently exposes his bees to the danger of famine. It is bad practice to deprive a hive on *both* sides, but it seldom happens that more than two combs can be extracted on one side, without interfering with the brood combs, which, in other words, is tantamount to the destruction of the hive.

In the works of Varro and Columella, we find some interesting remarks relative to the deprivation of hives, for it would appear in their time as if suffocation were totally unknown. The former of those naturalists mentions two methods of proceeding ; one by changing the bees from one hive to another, and the other by deprivation. He is however very sparing of his information relative to the details of those operations, but he is manifestly in an error when he says, that nine-tenths of the honey may be extracted.

The method of collecting the produce of a hive by suffocation is adopted in most countries, but especially in England, France, and Italy. In Germany, the great bee masters are more inclined to the storifying system, which in their opinion renders the act of deprivation easy and safe. Ranconi, in his Dictionary on Italian Agriculture, says,

" that the suffocation of bees is a most abusive practice, as it tends to destroy this species of insects, so interesting by their ingenious industry."

The most strenuous advocate for suffocation amongst the foreign naturalists, is M. La Grenée; and it must be admitted, that his arguments carry with them a great degree of validity. It must however be considered, that M. La Grenée draws the comparison between the three systems of suffocation, deprivation, and moving the bees from one hive to another. We will translate the following passages from the works of M. La Grenée, as they cannot but be highly interesting to every one connected with the culture of the bee :—

" When the bees are removed from one hive to another, the operation should be performed immediately after the departure of the first swarm, which will give them time to collect a sufficiency of food in their new habitation. But then the question arises, what is the quantity of honey which at that period of the year would be found, even in the most populous hives ? Not more than ten or twelve pounds, and frequently much less. No comparison therefore can be formed of that produce, with that which would be yielded at the end of August, or the beginning of September, when the bees have collected their winter store, amounting to thirty, forty, fifty, and frequently eighty pounds.

" If I be answered that the lives of the bees have been preserved, I should be inclined to admit the validity of the answer, provided it was shown to me that positive success had actually attended the operation, which however cannot be shown; on the contrary, it is well known that scarcely two hives out of ten survive the operation. Independently of which, the fact must be admitted, that a second swarm has been lost, which in a few days would have left the hive, and most likely the brood of a third, which although not

an actual benefit, would perhaps be at the end of the season a better hive than that which has been removed.

"We will however make a calculation of the produce of this method, compared with that produced by suffocation. We will suppose a person having ten hives, and according to the removing system, each will produce twelve pounds of honey, amounting in the whole to 120 pounds, and the proprietor will have in his possession twenty hives, ten old and ten of the current year: the 120 pounds of honey may be valued at 9*l.*, and the twenty hives at 20*l.*

"According to the suffocating system, each of the ten hives will produce thirty pounds of honey, amounting to 300 pounds, and the proprietor will have ten first swarms, and ten of the second and third, supposing the two latter to be joined. The 300 pounds of honey will amount to 22*l.* 10*s.*, and the hives to 20*l.* Thus a considerable difference is manifest: the public are put into possession of 300 pounds of honey, the proprietor has realized 22*l.* 10*s.* in money, and twenty hives as his stock for the ensuing year."

The statement of M. La Grenée appears at the first view to be very plausible, but we will contrast it with the following calculation. Let it be granted that M. La Grenée has obtained by suffocation forty pounds from his hive, whilst we by deprivation have obtained only ten. The advantage is apparently much in favor of M. La Grenée; but let it be taken into consideration, that he has killed his bees, whilst ours are in a state of preservation *. In regard to swarms we stand upon the same footing; we have both ob-

* In the transactions of the Western Apiarian Society, one of the aims of which was to encourage deprivation, there is an account of a Mr. W. A. Barnet, who from twelve hives obtained 318lbs. of honey-comb, and in the same year from the hives of his friends he took 1687lbs. 4oz. of comb, making altogether 2005lbs. of comb, and every one of the hives survived. It is with great regret that we learn that this society, whose exertions were so great and meritorious in the encouragement of the culture of the bee, is no longer in existence.

tained a first swarm, as part of our stock for the ensuing season, which, however, is to be deprived by us of a portion of the store, but to be suffocated by M. La Grenée. We will suppose that we preserve our hive for ten years, each year yielding ten pounds of honey at the minimum ; we have then in ten years obtained 100 pounds of honey from one hive, whilst M. La Grenée has only received forty, independently of all the swarms and the produce of them into the bargain.

From this calculation, the system of depriving the hives is far preferable to that of suffocation. Were there a superabundance of hives in this country, the suffocation of the supernumerary ones might be an act of policy, but until the culture of the bee is more encouraged in this country, the annual destruction of hives is a direct national evil, and every means ought to be adopted to check the practice of it.

EIGHTEENTH CHAPTER.

ON THE NATURE OF HONEY, AND THE METHOD OF COLLECTING IT BY THE BEES—ITS NATIONAL AND DOMESTIC ADVANTAGES.

CHARACTER OF HONEY ACCORDING TO THE ANCIENTS—LONGEVITY ASCRIBED TO HONEY—CHARACTERISTIC QUALITIES OF HONEY—DIFFERENT KINDS OF HONEY—TWO SPECIES OF HONEY IN NATURE—THE HONEY DEW—OPINIONS OF DUCARNE AND BOISSIER DE SAUVAGES RESPECTING HONEY DEW—OPINION OF MR. KNIGHT—DISCUSSION OF THE QUESTION OF THE FALL OF THE HONEY DEW—HONEY ELABORATED IN THE STOMACH OF THE BEE—ITS WONDERFUL POWER—MANIPULATION OF HONEY—ADJUSTMENT AND PREPARATION OF THE UTENSILS—THE PRESS NOT USED IN THIS COUNTRY—PURER HONEY OBTAINED BY MANUAL LABOUR THAN BY THE PRESS—CONSTRUCTION OF A SIEVE—GLAZED EARTHEN VESSELS THE BEST ADAPTED FOR HONEY—METHOD OF CUTTING THE COMBS—PARTICULAR EXAMINATION OF THE COMBS RECOMMENDED—THE COMBS TO BE CUT HORIZONTALLY—HEAT NECESSARY TO ACCELERATE THE FLOWING OF THE HONEY—THE COMBS TO BE PLACED IN THE SUN OR BEFORE THE FIRE—THE LATTER TO BE PREFERRED—METHOD OF OBTAINING THE SECOND OR INFERIOR KIND OF HONEY—THE UTENSILS EMPLOYED IN THE MANIPULATION OF HONEY TO BE PUT IN THE VICINITY OF THE APIARY—PARTICULAR ATTENTION TO BE PAID TO THE SECOND HONEY—METHOD ADOPTED BY THE FRENCH TO IMPART A PECULIAR FLAVOR TO HONEY—DIFFERENT COLOURS OF HONEY—THE QUALITY OF HONEY DIFFERS ACCORDING TO THE COUNTRY IN WHICH IT IS COLLECTED—FALSE PREJUDICES RESPECTING HONEY GATHERED FROM HEATH—RICHNESS OF THAT SHRUB IN HONEY—THE CRITERIA OF GOOD HONEY—METHOD OF RESTORING HONEY DETERIORATED BY FERMENTATION—ADULTERATION OF HONEY—ERRONEOUS SYSTEM OF THE COTTAGERS—DIFFERENT METHODS OF ADULTERATING HONEY—METHODS OF DETECTING IT.

HONEY was regarded by the ancients as the chief production of nature, and as a present from the gods. The sacred and profane writers have exalted its virtues: the poets have chaunted them in their verses. With honey, the ancients made their libations round the tombs of those who were dear to them; with honey, the Greeks preserved their corpses, considering it as an incorruptible substance. For the purpose of appeasing the gods, it was poured on the altars and on the heads of the victims. In their triumphal

processions, and at their great feasts, there was always a number of slaves carrying vases on their shoulders filled with honey, of which they made their libations.

The most remarkable longevities have been ascribed to the use of honey; and history has on record, that Pollius Romulus, who reached an extraordinary old age, on being interrogated respecting the regimen which he adopted, answered, *Intus mulso, foris oleo.*

The modern Greeks consume large quantities of honey, as they consider it particularly useful to aged persons, or to those suffering with consumption, or whose strength has been reduced by sickness.

Honey is a gummy, saccharine, fermentative juice, one of the immediate principles of vegetables, and which has received a particular elaboration in the stomach of the bees. It is in this laboratory that it assumes that viscidity and consistency, which it did not possess in its natural state, and also that peculiarity of fragrance and taste by which it is so essentially distinguished.

There are several kinds of honey, such as virgin honey, pure honey, and coarse or heath honey, which may be called the honey of commerce. In France it is distinguished by the name of the country in which it is produced. That of Narbonne, Provence, and Languedoc, being considered the best. Then come the honeys of Champagne, Touraine, Picardy, Brittany, and Normandy, the latter being considered of the worst quality.

Virgin honey is the produce of the swarm of a swarm, but it is by no means superior to that of the parent swarm.

Pure honey is that which has dripped from the combs without any pressure, and consequently uncontaminated by any of the crude substances in the hive, such as bee bread, abortive brood, &c.

Common, or heath honey, is that which has undergone

the operation of pressure, and is consequently an adulterated article.

There are in nature two species of honey, one which is contained in the calyx or nectarium of the flower, and the other, which is an exudation on the leaves of trees. The latter is particularly abundant on the oak, the laurel, and the bramble, and on the first view it appears difficult to be accounted for, how the exudation of a plant, which is in itself of a poisonous and deleterious kind, can be of an innoxious and wholesome nature. The juice of the laurel, obtained by compression or distillation, is a virulent poison, containing perhaps more prussic acid than any other plant; and it was this circumstance on which many persons have founded their opinion, that the viscous and saccharine matter, which is to be found at particular seasons on the above mentioned trees, could not be an exudation, but must have fallen upon them in the nature of a dew.

We will however insert the opinions of some very able naturalists on this interesting subject, amongst whom stand conspicuously Mr. Ducarne and Mr. Boissier de Sauvages. The former was an advocate for the fall of the honey dew, denying it altogether to be an exudation, and he expresses himself as follows in one of his letters:—"You know what that honey is, which the bees collect with so much ardour from the flowers, but you do not perhaps know that there are two kinds; one, which is the real honey, being a juice of the earth, which, proceeding from the plants by transpiration, collects at the bottom of the calyx of the flowers, and thickens afterwards; it is, in other words, a digested and refined sap in the tubes of the plants; the other, which is called the honey dew, is an effect of the air, or a species of gluey dew, which falls, earlier or later, but, in general, a little before and during the dog days. The dew alights on the flowers and the leaves of the plants and trees, but the heat

operating on it, coagulates and thickens it, whilst, on the other hand, the honey which falls on the flowers is preserved a much longer time.

"It is said that an abundance of this honey dew renders the bees idle, and makes them careless of collecting the common honey from the calyx of the flowers. I, however, never saw them collect it, but upon the flowers; one great advantage however of the honey dew is, that if the season be foggy and moist, and especially if attended with small rain, this rain, or the too great humidity of the air, mixing with the honey dew, corrupts it, and forms a composition very inferior to the honey of the first species, or to that which has not undergone this adulteration.

"Those persons who have not viewed the honey dew fall, like myself, have asserted, that it is nothing more than the sap or juice of the plants, which, in hot weather, experience perhaps a greater fermentation, and by which it is forced through the leaves. In contradiction to this, I assert, that it is perceived much better in the morning before the sun has been able to dry and harden it. Those persons are, however, deceived. *I have not only seen this honey dew fall a hundred times in the* form of a fine rain on the leaves of an ash, but I have also shown it to others, and the globules were most distinctly perceived."

It is only by a collision of opinion on speculative matters that truth can be elicited; but when positive experience is called in as the support of any circumstance of nature, and that experience differs in its most essential points, truth then becomes a matter difficult of acquirement, and the human mind is bewildered as to which particular system to attach its credence. Thus Mr. Ducarne asserts that he has seen *the honey dew fall a hundred times*, and that which a man has seen a hundred times has some claim upon our belief; we will now, however, investigate the arguments of another naturalist, who attempts to prove that Mr. Ducarne

must have been deceived in what he saw, and that the honey dew is not an atmospheric phenomenon, but a positive secretion of certain trees and shrubs, and exuded by the power of heat.

"I have long adhered to the opinion," says Mr. Knight, "that the honey dew dispersed on the leaves of the trees, was only an exudation, although the form of the globules scarcely bore any resemblance to each other, but were rather an imitation of a species of rain. On examining more minutely different trees on which the honey dew was apparent, chance led me to the discovery of a holm-oak, on which the honey dew had recently appeared, and in its primitive form, which is that of a transfused humour. The leaves were covered with several thousands of globules, or small round and compact drops, which, however, seem to be either touching or intermixing, similar to those which are seen on the plants after a thick fog. The position of each globule appeared to indicate, not only the point from which it exuded, but also the number of the pores or the glands of the leaf, in which this mellifluous juice had been prepared. I assured myself that the honey dew possessed the real colour of honey, which alone was sufficient to decide on its origin, without at the same time removing the doubts which a contrary prejudice establishes. The honey dew of a neighbouring bramble was not constituted the same; the little globules had no doubt commixed, or, being united to each other, either by the humidity of the air, which had dilated them, or by the heat, which had promoted their extension, they formed large drops or broad layers, the dried matter of which had become more viscous. It is under these latter forms that the honey dew is commonly perceived, and our surprise need not be great that exudation is not suspected as the cause.

"In the season when I remarked the honey dew in globules on the evergreen oak, the tree bore two sorts of

leaves; the old ones of a close texture, like those of the holly, or of those trees which on the approach of winter do not shed their leaves, and the new ones, which were yet tender, and had shot forth only a short time. The honey dew appeared constantly on the leaves of a year old; the leaves were however still covered with the tufts of the new shoot, and consequently sheltered from all species of rime or drizzling rain which might have fallen; this is, in itself, a convincing proof that the honey dew is not foreign to the leaves of the trees which are moistened with it, and that it never appears in any other place, as it is commonly supposed; as the new shoot of our evergreen oaks, which ought to have been touched the first, as being the most exposed, did not exhibit the smallest drop.

"The same singularity struck me in regard to the honey dew of the bramble; although by the conformation of the shrub, all its leaves are exposed nearly equally to the air, or to the fall, which would take place vertically. The honey dew only appears on the old leaves; the new ones had not more than the new shoot of the oak, of which mention has just been made: the mellifluous juice not having had, without doubt, a sufficient time to be formed in the tender part of those vegetables, or to be extracted from the sap. It is probably only the long exposition to the air, perhaps to its intemperature, and especially to the sun, which ought to be regarded as the true agent of the secretion.

"To elucidate this subject further, the plants and shrubs in the vicinity of the trees on which the honey dew appears, but of a different species, and of a nature less suitable to the formation of the juice, of which I am now speaking, do not carry the least vestige of it. The honey never appears on the rocks nor stones under the trees, on which it is generally found, which is a fresh proof that this species of liquid manna *does not fall from the clouds like rain,* as it would diffuse itself indifferently on all kinds of bodies, and

could not appear only on certain vegetables, and even on some of those parts to the exclusion of the remainder."

The circumstance however which is most in favour of the presumed fall of the honey dew from the upper regions of the air, is, that it is only the upper part of the leaves which is moistened with it. It is also conformable to experience, that the viscous matter appears only on certain leaves, that is, on the new ones, and those which are the least exposed, and this attraction or attachment is not the effect of chance. It is further ascertained, that it is on the side of the leaf, where the pores are most open and distinguished, that the greatest exudation of the plants takes place. It is there that the excretory vessels unite, by which the humour of the plants escapes in the same manner as the absorbents, which serve for their nutrition in attracting the water of the rain, and the vapours, which are diffused in the air.

The question has been long disputed amongst naturalists, regarding the elaboration which honey undergoes in the stomach of the bee; and whilst some maintain that it undergoes a decided alteration, others affirm that it is deposited by them in the cells in the same state as it is extracted from the flowers. The latter hypothesis is, however, in a great degree invalidated by the circumstance, that the flavour and taste of the saccharine juice in the nectarium of the flowers are decidedly different, as may be ascertained by sucking the pips of a cowslip, and those of the white or red clover; whereas when these same juices are deposited in the cells of the bee, they have acquired one uniform taste and fragrance, which they did not possess in their natural state, as well as a viscidity and consistency which could only have been obtained by some unknown elaboratory process. Were the honey, when deposited in the cell, to be of that thin and fluid nature in which it appears in the nectarium of the flower, it would flow out of the cells; at the same time, it must be admitted, that the elaboratory powers of the stomach of the

bee must be wonderfully great, to change the nature of a natural production in so short a time as that which intervenes between the extraction of the mellifluous juices and their deposition in the cells.

We shall now proceed to give the necessary instructions for the manipulation of the honey, and the best means of preserving it.

In order to obtain honey of the first-rate kind, heat, expedition, and cleanliness are particularly required. As soon as ever the combs are extracted from the hive, no time whatever should be lost in commencing the operation, and the first step to be taken is the adjustment of the necessary utensils. In the great honey districts of France and Germany, the honey is almost always obtained by means of a press, somewhat similar to the cider presses of this country, or to the oil mills of Holland. In this country, however, the collection is not so great, but that the whole operation may be performed by the hand; and it is certain that the honey so obtained is better and purer than that which is obtained by the press; as in the latter case the honey becomes adulterated by the admixture of bee bread, abortive brood, and other noxious substances, which abound more or less in every hive.

A sieve is the first and most necessary implement that is required, and it should be made about a yard long and two feet broad. The bottom should be of tin, well perforated with large holes, or it may be made of coarse hair cloth, sufficiently large in its texture, so as to admit freely the passage of the honey. Glazed earthen vessels are the best adapted for receiving the honey, as wood, particularly deal, from its resinous nature, is apt to impart an unpleasant flavour to the honey, which is prejudicial to its sale.

Previously to the combs being cut, they should be carefully examined as to the quantity of bee bread or brood which they may contain, and which should be carefully cut

out before the cutting of the combs is commenced. It is impossible to procure honey in its utmost purity, unless the strictest examination be made as to the absence of all noxious matter which may be lodged in the combs, and to which in general so little attention is paid by the cottagers of this country. It must also be observed, that the majority of the keepers of bees act upon a most erroneous system in the cutting of the combs, for they generally cut them in all directions, just as if they intended to make mince meat of them; whereas a little consideration ought to teach them, that chop and hack as they will, it cannot be expected that they can cut through *every* cell. The most proper method therefore is to cut the combs horizontally, and twice is perfectly sufficient; that is, each layer of cells should be cut through, which will open every cell in them; but it must be observed, that the *middle part* ought to be frequently turned, in order to allow the honey to flow from both surfaces of it: nor under those circumstances does any valid objection exist to the combs being also cut transversely, which will, in some measure, expedite the operation, which in cold weather particularly is frequently of a tedious nature.

Heat is actually necessary to accelerate the flowing of the honey, and the sieve should therefore be placed before the fire; or if the operation be performed in the summer after deprivation, the sieve may be placed in the sun; but we prefer the heat of the fire, for the sake of expedition. The honey, as it flows into the earthen pan, should be put into the pots in which it is to be preserved, and kept in a place free from all humidity and unpleasant odours.

The honey thus obtained may be considered as the prime sort, and the second or inferior kind is obtained in the following manner: the combs are cut very small, and then pressed between the hands, or with a flat spatula or spoon. It seldom happens in this country that a sufficient quantity is obtained to require the aid of a press, and consequently

manual pressure will be found competent for all the purposes of an English apiary. It is recommended by some bee masters or bee mistresses, particularly the latter, to squeeze the combs through a coarse cloth, in preference to squeezing them with the hands, on the supposition, that a certain quantity is lost by adhering to the hands, which on the cloth is given to the bees to be conveyed into the cells. In fact, all the utensils employed in the manipulation of the honey should be put in the vicinity of the apiary; the bees will soon scent it, and in less than half an hour every globule of the honey adhering to any part of them, will be carried into the hive. This plan, however, is adopted on the supposition, that no mead is made; as in that case, the utensils are all washed with water, which is mixed with that of which the mead is made.

This second or inferior honey will require a little attention being paid to it after being poured into the vessels in which it is to be kept, which is not requisite with the prime sort. A scum will frequently rise to the top of the second honey, which, if not taken off, is apt to ferment, and in a short time deteriorate the whole of the honey. In some instances the honey will be so foul, from the quantity of bee bread and other noxious substances intermixed with it, as to render it wholly unfit for the market. In this case it should be passed through a sieve, resembling a jelly bag, and this operation should be repeated until the honey has obtained a comparative degree of transparency.

The French impart a peculiar flavour to their honey by placing orange flowers and other aromatic herbs in the sieve through which the honey passes. This artificial flavour is supposed by many to proceed from the peculiar kind of flowers from which the bees extract their honey, and in the great honey districts of Narbonne and Languedoc, the honey has always an artificial flavour imparted to it, which enhances its value in the market.

It has been remarked, that the honey collected in the vicinity of forests is of a reddish hue, of an acrid and purgative nature; that which is collected in the plains and meadows is white, more nourishing and less purgative; and thirdly, that which is collected from the meadows in the vicinity of woods, partakes of a middling character, and is, in some respects, preferred to the two former.

It is certain that honey is not equal in its quality, and this difference undoubtedly arises from the peculiar kind of country in which the bees are domiciliated. Thus a prejudice, and a very false one it is, exists against the honey which is collected from the heaths; so much so, that the most inferior kind of honey of commerce is known by the name of heath honey, whereas there is perhaps no herb which yields a greater quantity, or a purer kind of honey, than heath. A hive removed to the vicinity of heath in August will increase in weight ten or twelve pounds, which if allowed to remain in its original situation would not have gained perhaps three pounds in weight. That honey is the best which is new, transparent, of a sweet and agreeable smell, rather aromatic, and when deposited for some time in the pots assumes a hard consistency. The ropy honey, resembling treacle, should always be rejected, for that very quality bespeaks its adulteration. The whiter the honey, the purer is the grain of it, and the honey of the spring is generally to be preferred to that of the summer.

The second kind of honey is sometimes apt to ferment, owing to the admixture of heterogeneous substances with which it abounds. It may be brought back nearly to its original state, by exposing it to a cold temperature. The concrescible part of the honey assumes a solid form, whilst the fermentable part remains liquid. The separation can then be easily effected.

There are few articles in trade which are more adulterated than honey; and the article which is sold in the London shops,

under the name of prime honey, bears little or no affinity with the real nature of that article. As it is generally sold by weight, the cottagers take care in the first instance that the honey shall not pass into the hands of the wholesale dealers without receiving its due proportion of flour or other heavy farinaceous substances; which in a short time places the honey in a state of fermentation, and divests it of a great portion of its natural sweetness. A second adulteration takes place when it comes into the hands of the retail dealer, and thus the native virtues of the article are completely destroyed. The detection of the admixture of flour with honey is very easy. Dilute a little honey with cold water, and if it be adulterated with flour, the water will become of a milky hue. Another method is to clarify the honey, by placing a small quantity in a jar, which must be half immersed in a saucepan of water. When the water is brought to a boiling heat, the honey becomes perfectly liquid and clarified; but if adulterated, a thick scum rises to the top, which on being taken off and suffered to grow cold, crumbles into a farinaceous dust.

NINETEENTH CHAPTER.

ON THE NATURE AND ORIGIN OF WAX.

ORIGIN OF WAX ACCORDING TO HUBER—HONEY THE COMPONENT PRINCIPLE OF WAX—THE FANCIFUL CONCEITS OF HUBER—OPINION RELATIVE TO THE NATURE OF WAX, INSERTED IN THE "SPECTACLE DE LA NATURE"—HYPOTHESIS OF JOHN HUNTER—ITS FALSITY—ANALOGY BETWEEN SILK AND WAX AS ELABORATED SUBSTANCES—THE ELEMENTS OF POLLEN DIFFERENT FROM THOSE OF WAX—THE EXPERIMENTS OF HUBER INCONCLUSIVE—WAX, ACCORDING TO HUBER, FORMED BY EXUDATION—HYPOTHESIS OF LATREILLE—THE WAX POCKETS OF HUBER—ANALYSIS OF WAX BY MARTIN—OPINION ADVANCED IN THE "DICTIONNAIRE DES SCIENCES NATURELLES"—EXPERIMENT TO DETERMINE THE FARINA OF PLANTS BEING TAKEN INTO THE SECOND STOMACH OF THE BEE—COMPARISON OF THE DISCOVERY OF HUBER WITH THE HYPOTHESIS OF LATREILLE, MARTIN, DR. HOWISON, &c.—SCALES OF WAX, ACCORDING TO HUBER, FOUND BETWEEN THE RINGS OF THE ABDOMEN—CONTRADICTIONS OF HUBER—WAX A CRUDE PRODUCTION OF NATURE, CONFIRMED BY MR. KNIGHT—OBJECTIONS TO THAT HYPOTHESIS—HUBER'S DESCRIPTION OF THE BEES SECRETING WAX—FESTOONS OF BEES—ERRORS DISSEMINATED BY THE "SOCIETY FOR THE DIFFUSION OF USEFUL KNOWLEDGE"—THE BEE A SOLITARY WORKER—DIFFERENT LABOURS OF THE BEES—THE WAX SECRETED EXTERIORLY TO THE HIVE—CONSTRUCTION OF A CELL BY A BEE, ACCORDING TO THE VISION OF HUBER—PROGRESS OF THE FORMATION OF A COMB—THE STRUCTURE OF A CELL NEVER YET OBSERVED—SYSTEM ADOPTED BY THE BEES IN THE FORMATION OF A COMB—ENORMOUS COMB MADE BY THE BEES, ACCORDING TO HUBER—GENERAL SIZE OF THE COMBS—THE COMB OF HUBER, A DIRECT IMPOSSIBILITY—AN UNLIMITED SPACE NOT FAVORABLE TO THE WORKS OF THE BEES—RESTRICTION OF THEIR LIMITS, EXEMPLIFIED IN THE FORESTS OF POLAND AND THE UKRAINE—SWARMS, ACCORDING TO HUBER, DO NOT BRING HOME POLLEN—DISPROVED BY EXPERIENCE—ARGUMENTS IN FAVOUR OF THE FORMATION OF WAX FROM POLLEN—A CELL NEVER ENTIRELY FILLED WITH POLLEN—THE EDGES OF THE COMBS, ACCORDING TO HUBER, MADE WITH PROPOLIS—THE COLOUR OF THE COMBS NOT CAUSED BY HEAT—CAUSES OF THE EDGES OF THE COMBS BEING OF A DEEPER COLOUR THAN THE INTERIOR OF THE CELL—HYPOTHESIS OF L'ABBE DELLA ROCCA—EXPERIMENTS OF REAUMUR—SINGULAR OPINION ADVANCED BY DUCOUEDIC — INVESTIGATION OF THAT OPINION—ORIGIN OF WAX ACCORDING TO THE ENCYCLOPÉDIE MÉTHODIQUE.

If we investigate the origin of wax as laid down by Huber, and echoed by Kirby and Rennie, we confess that we are struck with surprise, that in the middle of the nineteenth century, any individuals could be found who on the mere undemonstrated authority of another could propagate the preposterous doctrine, at variance with all experience and truth, that honey is the component principle of wax.

According to Huber, wax is a secretion found in the form of scales between the abdominal rings of the bee; and he pretends to have arrived at that decision from actual experiment and observation. It will not however be a task of great difficulty to refute that hypothesis, and to establish the real source from which wax originates.

To detail the different fanciful conceits which have emanated from the brain of Huber, not only in regard to the natural history of the bee, but to its properties and qualifications, as well as to the produce of its labours, would occupy too great a portion of our pages. It is, however, much to be regretted that his errors and misrepresentations have been acknowledged and received as the standard of truth. Under the auspices of his supposed infallible authority, the student of apiarian science finds himself grossly misled; Huber is generally appealed to as the only sure guide to the natural history of the bee, and all dissentients from his crude theories are branded with the epithet of ignorant and presumptuous pretenders. The time, however, we hope is near at hand, when the fallacy of his pretended discoveries will be fully exposed, and the natural history of the bee, as far as it can be ascertained, placed in its true and legitimate character.

In the investigation of the nature of wax, Mr. Rennie quotes several authorities in defence of his infallible leader; but he is very tender in touching upon any one which is in opposition to him. Amongst the latter, he quotes the *Spectacle de la Nature*, and declares the opinion contained in that work relative to the origin of wax to be founded in error, and to a certain extent we accord with Mr. Rennie; but on examination it will appear, that the author of that article, although contrary to the knowledge of Mr. Rennie, was actually standing on the threshold of truth. The main error of the author of the *Spectacle de la Nature* consists in considering the farina of plants *to be the wax itself*, without

being obliged to undergo any elaboratory process, nor requiring any other care nor skill from the bees, than the simple act of kneading it into the required form. Had he, however, gone a little further, and informed us, that the pollen of the flower is collected as the material for the formation of the cells, and that it is converted into wax by an elaboration in the stomach of the bee, he would have imparted to us the truth itself. The opinion of the late John Hunter, that pollen could not possibly be the constituent principle of wax, merely because the pellets of farina attached to the legs of the bees are of various shades and colours, was wholly unworthy of so great a mind; in fact, we will presume to assert, that John Hunter is not an authority to be consulted on the physiology of the bee. His objection to farina being the constituent of wax, on account of the diversity of shade which it exhibits, could only have been rendered valid by his fixing a limit to the elaboratory power of the bee, and obliging it to return the elaborated substance of the same shade and colour, as it was when imbibed. The silk-worm nourishes itself on a substance which is green; that same substance, however, in an elaborated state, is either white or yellow, and therefore by analogy we are authorized to conclude, that although the farina imbibed by the bee may be of different shades, it still may, by the process of elaboration, of the active principle of which we are ignorant, be converted into one uniform colour, which is white. Hunter, however indebted as we are to him for his minute researches into the anatomy of the bee, knew very little of the internal economy of the hive; for, as we have already observed, he considers bee bread to be the excrement of the bee, although in a few sentences afterwards he speaks of it as a substance of which he cannot discern the actual use, although he had previously denied it to have any co-operation in the formation of wax.

The adherents of Huber have attempted to overthrow our

hypothesis on the origin of wax, from the principle that no affinity exists between pollen and wax, and that upon an analysis, the constituents are found to be essentially different, *ergo*, pollen cannot be the element of wax. We most willingly give to our opponents the full force of their observation, and it is highly complimentary to us to reflect, that they have no other weapons with which to combat us. Let us in return inquire of them what affinity exists between the silk of the silk-worm, and the mulberry leaf by which it is produced; or what is perhaps more relevant to the point, what affinity can be traced between the papery substance of which the nest of a wasp is made, and the materials which the insect collects for the purpose? What affinity exists between the attenuated thread of a spider and the fly on which it feeds? All these substances are the direct effect of elaboration. The utmost power of chemical analysis would not detect the slightest presence of silk in the mulberry leaf, and, analogically reasoning, it is equally true, that no analysis of pollen will produce any affinity with wax. But are we thence entitled to draw the conclusion, that the elaboratory power of the bee, of the extent and principle of which we are ignorant, is incompetent to alter the original character of pollen, and to produce a substance differing from the material of which it is made? Independently of which it is so easy for us to retort upon the Huberians, and call upon them to explain to us, what degree of affinity exists between honey and wax; the former of which, according to the dictum of their master and leader, is the element of the latter. It must be also considered, that the experiments which Huber pretends to have instituted, in order to establish his hypothesis of honey being the constituent of wax, are by no means conclusive nor confirmatory of it; on the contrary, some of them tend to a positive refutation of the fact altogether, for Huber loses himself in a labyrinth of contradictions and paradoxes, in which he is

followed by the Professor of King's College, with his Huberian disciples at his heels, Messrs. Kirby and Spence being the whippers-in.

Huber, in all his experiments, does not prove in a single instance that no pollen, in a state of elaboration, was to be found in the stomach of the bee; nor does he inform us that he killed some of the bees in order to detect the presence or absence of that substance; but he grounds the whole of his hypothesis upon the single fact, that he confined a certain number of bees, feeding them simply on sugar and honey; the result of which was, that some combs were constructed. From which circumstance Huber draws the inference, that as there was not any pollen in the hive, nor, as far as he knew, that the bees had any access to it in another quarter, honey, or, in default of that substance, sugar, is the constituent principle of wax. Thus, according to Huber, it is of no material consequence with what aliment the bees are fed, whether it be honey, sugar, molasses, or syrup, wax can be made of each, not however as it will be seen by any elaboration in the stomach of the bee, but by exudation.

On this subject Latreille says, "the first stomach of the bee is appropriated to the reception of honey, but this is *never* found in the second stomach, which is surrounded with muscular rings, *within which the wax is produced*, but the secreting vessels for this purpose have hitherto escaped the researches of the acutest naturalists."

In order, however, to investigate this statement of Latreille, we are told by the editor of the Insect Architecture, *that these secreting vessels are contained in the internal linings of the wax pockets, which consist of a cellular substance, reticulated with hexagons*, in the writing of which it may be supposed that Mr. Rennie had Johnson's definition of network in his remembrance. We have, however, here a plausible conjecture of Huber placed in opposition to the

actual experience of so skilful a naturalist as Latreille, whose opinion is scientifically correct; whereas the hypothesis of Huber is mere fancy and conjecture, without even possessing the support of plausibility, which Mr. Rennie attaches to it.

If, however, we confine ourselves simply to Latreille, that wax is produced in a stomach into which honey never enters, it follows of course that honey cannot be the constituent principle of wax, as it is in that stomach that the wax is formed. The question then arises, from what source is wax produced? We answer, by the deglutition of the farina, which, in the second stomach undergoing a certain elaboratory process, is by the bees manipulated into that substance denominated wax.

Latreille is, however, by no means solitary in his opinion respecting the origin of wax, for it is now generally adopted by all the French naturalists, who treat on the history of the bee. Thus in Martin's *Nouveau Manuel Complet du Propriétaire des Abeilles*, we read, "*La cire est une substance inflammable, concrète, qui n'a point d'analogue. Elle est le produit des abeilles qui vont récolter le pollen des fleurs, pour lui faire subir dans leur estomac une élaboration particulière, dont il sera bien difficile d'expliquer le mécanisme, et à l'aide de quelle, cette matière végétable est convertie en la substance, dont elles se servent pour construire les alvéoles.*"

We find the above opinion corroborated in the *Dictionnaire des Sciences Naturelles*, in which it is said, "*Il est probable que le pollen des végétaux a besoin de subir à l'action de l'estomac, pour être changé en véritable cire; car quelque tems après que les abeilles l'ont mangé, elles les dégorgent par l'extrémité de la trompe, sous une forme ductile et très molle, et c'est alors qu'elles construisent les parois des cellules, et dont l'ensemble porte le nom de Gateaux ou de Rayons.*"

A very favourable opportunity once presented itself to us, and which we had been long anxious to obtain, of com-

pletely verifying the hypothesis of the farina of plants being taken into the second stomach of the bee, there to undergo the requisite elaboration for the formation of wax. In one of our hives, the entrance of which had been enlarged, we had omitted to smoothen the sides; the consequence of which was, that the bees, who crowded into the hive with the pellets of farina, had them frequently rubbed off by the roughness of the straws projecting on each side of the entrance. Being desirous of ascertaining whether the bees would take any notice of the pellets which lay on the platform, we carefully watched all their motions, and in a very short time observed three bees settle round one of the pellets, and by the aid of a magnifying glass, it was distinctly to be seen, that the bees were eating the pellets, which by degrees wholly disappeared. We waited until one of the bees indicated his intention to enter the hive, when it was killed, and not a moment was lost in dissecting it. A very small quantity of honey was found in its vesicle, but in the second stomach, the pollen just eaten was distinctly perceptible, having as yet undergone but a very slight change in its colour and consistency. It must be observed, that there is neither duct nor passage leading from this second stomach, by which the pollen in a digested state could be excrementally voided. There are therefore only two ways of accounting for its disappearance from the stomach; the first is by disgorgement by the mouth, as the constituent of wax; the second is by exudation, which we shall shortly show to be a reverie of Huber's brain.

We will now proceed to compare the discovery of Huber with the opinions of Latreille, Martin, Dr. Howison, and other late writers on the natural history of the bee.

Wax, according to Huber, is made from honey; but we are subsequently informed, by the same person, of the existence of scales of wax between the rings of the abdomen; and with the view of confirming this most untenable hypo-

thesis, he invests the bees with a singular appendage, which he calls *wax-pockets*, from which they take, already made to their hands, as from a purse, just as much wax as they require for their immediate use; and, for our further edification, we are told, that these scales of wax are larger in some bees than in others; and under the supposition that he had not taxed our credulity sufficiently, he instructs us, that he further observed, on the membrane of these wax-pockets, a slight liquid medium, which lubricates the joinings of the rings, and renders the extraction of the scales more easy.

Here then we arrive at another of the gross contradictions of Huber. In the first place we are told, that wax is produced from honey, or from any other saccharine matter, mingled with a little water. Subsequently, however, we are informed, that it is found in scales already made, but at the same time it is accompanied by the admission, that *if* the substance found so lying under the rings of the abdomen be in reality wax, or even the element of wax, *it still undergoes some subsequent preparation by elaboration* after it is detached; in short, that the bees possess the power of impregnating it with some matter in order to impart to it ductility and whiteness; but what that matter is, or from what quarter it is obtained, whether natural or artificial, Huber has omitted to inform us. Nevertheless, he finds it convenient to admit of wax being a crude production of nature, and collected by the bees from certain flowers; an hypothesis strenuously upheld by Mr. Knight, the President of the Horticultural Society; nor would he consent to its being an elaboration in the stomach of the bee, taking honey as the constituent principle, for he therein saw that he was involving himself in a dilemma, the tendency of which would be to overthrow his system altogether. He therefore fell upon the extraordinary expedient of forming his wax by exudation, that is, that the bee shall swallow a certain quantity of honey and water, or sugar and water;

and instead of its serving for its aliment, it shall be converted into wax by some particular and mysterious process, and exude as such in larger or smaller scales, according to the nature of the bee or the size of the wax-pockets. It must, however, be taken into the account, that exudation presupposes the existence of a porous body; now in neither of the stomachs of the bee are we able to trace such a construction as could lead us to suppose that it were possible that any saccharine substance imbibed into them would be able to transude.

Huber has also forgotten to mention whether this transformation of honey into wax be a natural and invariable principle of action in the bee, or whether it be accidental or optional. If the former be the case, the scales of wax ought to be found between the rings of the abdomen at all times and seasons, and also, without exception, in every bee in the hive. To this part of the system we are enabled to give a decided negative; for, after the closest examination, we never could discover the presence of the minutest particles of wax in any part of the body. If the transformation be optional, with what an extraordinary power must the bee be invested, and how miraculous must be that concert of action which can so govern the bees, that the transformation of honey into wax shall take place only at particular times and seasons, and that the exuding power shall only be put in force when a supply of wax is required.

Huber is however very minute in the results of his researches, and it is this very extraordinary refinement of detail which has obtained for him such a spurious reputation. In the present case, for instance, we are informed, although at the same time there is not a particle of truth in the whole of the information, that amongst the workers in a hive, some belong to the class of *architects*, who plan and build, and who act also in the capacity of *nurses* to the young. Others of a lower grade in the community, similar to the Irish hods-

men, who only bring the materials, but who possess not sufficient skill to impart to those materials any definite shape. The former, Huber ranks in the class of *nurse-bees*, the latter in that of *wax-workers*, or such on whom nature has bestowed pockets or reticules, in which they carry the wax about with them. There is also a decided distinction in the labours of the nurse-bees and the wax-workers, and it would be as ridiculous and presumptuous in the former to attempt to manipulate the wax, as it would be in the latter to attempt to make it. The wax-makers are represented by Huber as gorging themselves to direct satiety with honey from the flowers, and having filled their vesicle to suffocation, they by some miraculous concert of action meet in a body, and *hang motionless in festoons, that is, like folds of curtains, one above another*, and in twenty-four hours, not more nor less, the white scales of wax appear under the rings of the abdomen ! ! !

Deeply is it to be deplored, that the Committee of the Society for the Diffusion of Useful Knowledge should have allowed the pages of their miscellany to be sullied by such a tissue of error and misrepresentation. In that work we have a drawing presented to us of this festoon of wax-workers, a phenomenon never beheld by Huber, nor by any other person who has paid even the slightest attention to the internal economy of a hive. The bee is, in every instance, exteriorly to the hive a solitary worker; he leaves the hive alone; he directs his flight to the well-known fields of his pasture; he returns to the hive apparently careless and independent of the rest of the community, and attentive only to the particular labour in which he is engaged. And then the time during which the bees hang so gracefully in the form of a festoon, how very consistent is the whole tale with all truth and experience. In twenty-four hours the wax has exuded, it appears in scales under the rings of the abdo-

men; the process is completed, the festoon is broken up, and the bees return to the hive.

It must be particularly remarked, that this festoon is not made *in* the hive, but *exteriorly* to it on a bunch of flowers, and therefore Huber has left one material point untouched; which is, the precise time of the day when the wax-makers congregate for the purpose of forming themselves into the festoons on the flowers. It may be early in the morning or late in the evening, at all events as twenty-four hours are required for the secretion of wax, the bees must therefore be necessarily obliged to bivouac under the shelter of a sunflower or a dahlia until the light of the morning enables them to find the way to their hive.

We will however follow Huber in his further extraordinary details, but previously we will quote a passage from his work, to the truth of which we give our unqualified assent. THE ARCHITECTURE OF THE BEES IS ALWAYS CONCEALED FROM OUR VIEW BY CLUSTERS OF BEES, AMIDST WHICH, AND IN DARKNESS, THE WORKS GO ON. In utter defiance, however, of the verity of that affirmation, Huber actually gives us his *ocular* observations of the manner in which the bees proceeded to make use of their secreted wax. After the twenty-four hours had expired, for he unequivocally asserts that he *saw* the curtain or festoon of wax-workers *in the hive*, and so correct was his vision, that he made a drawing of it, an engraving of which decorates the pages of the Insect Architecture. To repeat, however, the words of Huber, "*The architecture of the bees is always concealed from our view*," and yet he has furnished us with a drawing of the bees laying the foundation of a cell; one constructing the side, one on its back, another on its belly, one on its right side, and another on its left, all of which attitudes have given some employment to the wood-cutters engaged in the illustration of the Insect Architecture, and are admirably calculated to

astound the uninitiated, and impress them with an astonishing notion of the magical talent of Mr. Huber, who gives us an *ocular* description of things, which he positively and truly asserts are *concealed from his view.*

The architecture of the bees is always carried on in darkness, and is always concealed from our view, and yet, says Huber, quoting his own words, *I saw* a bee come out from the middle of the group, and clearing away a space about an inch round at the top of the hive, applied the pincers of one of its legs to its side, took off a scale of wax, and began to mince it with its tongue (the English bees have not any tongue), which sometimes appeared like a *bricklayer's trowel;* then it was flattened *like a spatula;* then it looked like *a broad-bladed knife,* and at another time it appeared *to end in a point like a pencil.*

The scale of wax, continues Huber, according to what from his own affirmation was concealed from his view, being detached from the side of the bee, became glutinous, and was drawn out like a riband. The bee, which had so detached the scale, is, by Huber, significantly styled "the founder," who having put all the wax it could make to the vault of the hive, very sedately took its departure; a second did the like; but the third, what did the third do? Huber, who knew all about the business, although it was concealed from him by darkness, *discovered* that the third bee was a consummate blunderer, some raw apprentice in the art of cell making, for he put his wax in a wrong line; on which another bee, more deeply skilled, shoved the blunderer most uncourteously on one side, removed the wax, which had been so improperly placed, and carrying it to the former heap, placed it exactly in the order and direction pointed out by "the founder;" the result of which was a little block of wax, which was fixed to the vault of the hive, *running in a straight line, with a rough surface, but round on its edges, half an inch long, sixth of an inch high, and about the twenty-fourth part of*

an inch thick; and yet the architecture of the bees is always concealed from our view!! The wax-workers having got the stock of materials ready, an architect or nurse bee quitted the cluster, examined both sides of the block, felt about with its antennæ or horns, and then like a skilful mason began to scoop out exactly in the centre as much of the block as equalled the size of a common cell, and after kneading what it had removed, placed it carefully at the sides of the opening. Having done this, it was succeeded by another bee, and in this manner twenty other workers followed in regular order, apparently well marshalled and disciplined, each taking proper care, as it became him, to push forward the material so as to extend the walls of the cell.

Reprehensible as Huber must appear in the eyes of every rational man, and of every true lover of science, in attempting to impose upon the public such false and incongruous statements, yet still more reprehensible must appear in the eyes of every one, a Society professing to be founded for the Diffusion of *Useful Knowledge* (?) which can propagate the absurdities of Huber as the results of positive experience, and call upon enlightened England to give credence to a series of romantic fictions, which mislead the ignorant and disgust the wise. The individual, who is bold enough to declare, that he has seen a bee lay the foundation of a cell, and build it, as the masons would say, to the coping stone, may with the greatest propriety boast of having seen that, which no one ever saw before him, and which we will venture to affirm no one will ever see again. We unhesitatingly declare, that we never did, nor do we ever expect to succeed in witnessing a bee complete the structure of a cell, much less then all those minutiæ, which are incorporated in the descriptions of Huber, and which have the injurious tendency to impress on the mind of his readers an extraordinary belief in the truth of his pretended discoveries, and to establish him as an authority in the history of the bee, from which

there is no appeal. The admission of light into the hive is the immediate signal for the suspension of all labour, and although it be granted that the mirror hive is the best adapted for wresting from the bees their hitherto impenetrable secrets, yet on no occasion did we ever open the flap of it, than an evident confusion reigned in the hive, and although the progress of their works might be ascertained since the last inspection, yet the immediate prosecution or continuance of them could never be observed. On the establishment of a swarm in a hive, a certain number of bees group themselves at the top, and to the casual observer they appear as if they were in a state of complete idleness, when on gently removing the outside bees, the beautiful white comb presents itself in the middle of the group, but the moment that they are molested, a cessation of all labour takes place. Huber has asserted, that in twenty-four hours he has known a newly settled swarm form a comb of *twenty-seven inches long ! ! and seven or eight inches wide ! ! !* We will, however, briefly investigate how far the construction of a comb of that size is consistent with the nature of the bee. Huber could not have been ignorant that the comb, which is first made in the hive of a first swarm, is invariably appropriated to the reception of the eggs of the young queen, and that honey is seldom or never deposited in any of the cells. Let us then suppose the bees forming a comb seven or eight inches wide, it must thence follow, of course, that the bees bred in those cells would be about four inches long; for it is well known that a young bee occupies the entire capacity of the cell, and that as it approaches maturity, the covering of the cell becomes convex, on account of the protrusion of its head. A comb of seven or eight inches in breadth is a direct impossibility in a hive. The side combs, which contain the finest honey, are considerably larger than the middle combs, which are chiefly destined for the brood, and therefore they never exceed in breadth twice the length

of the common bee, which breadth may be reckoned at the utmost to be one inch and three-quarters. We have known the side combs to measure two inches and a half, and in one instance they measured two inches and three-quarters; but a comb of eight inches in breadth would be a direct phenomenon, nor could it be adapted to that use for which the larger combs are constructed. Huber himself, in the construction of his leaf hive, allows only one inch four lines for the thickness of his combs, and he allows of eight combs or leaves in his hive. The entire breadth of his hives does not exceed one foot and a half: supposing, however, the combs to be eight inches in breadth, according to his own observation, and allowing eight combs in a hive, we should have a breadth, allowing the third of an inch between each comb, of five feet ten inches, or nearly two yards.

The height of Huber's hive is from fourteen to fifteen inches; that of the straw hive, generally in use in this country, is from ten to twelve inches; but it is on record, that Huber observed his bees construct a comb twenty-seven inches long in twenty-four hours, consequently the hive to contain the combs of that dimension must be nearly a yard in height. In every case that has come under our inspection, when we have examined the combs constructed by the bees in the roofs of houses, or in hollow trees, in which an unlimited space was allowed them to extend their combs, they never exceeded twelve inches in length. It is a false notion, that if an unlimited space be given to the bees in which to carry on their works, that they will gradually and annually extend them; on the contrary, they appear to know well the limits to which they ought to go, and beyond which, they can never trespass.

In numerous instances, not only in this country, but in the forests of Poland and the Ukraine, where bees are not domesticated, but take up their abode in the trunks of trees, we have invariably remarked, that great as the space may be

in which they have established themselves, their works seldom extend beyond the limits attained by them during the first year of their occupation. We had an opportunity for several years of observing the motions of a swarm, which had taken up its abode in the roof of Dunsinnan House, in Perthshire, when we observed, that in the year of their first establishment, they had constructed seven combs of about eighteen inches in length; in the second year an elongation was made to two of the side combs, and here the bees appeared to have arrived at the *ne plus ultra* of their operations, for no addition was afterwards made to their combs.

One of the proofs that Huber adduces in support of his hypothesis of the origin of wax is, that swarms newly settled do not bring home pollen, and, consequently, that as honey is known to be in their stomach, it must be the constituent of wax. Now this alleged proof of Huber is not based on truth, for we never had a swarm, nor ever saw a swarm belonging to others, in which there were not a number of bees actually with pollen on their legs, and that on the following day it was not also conveyed into the hive in a considerable quantity. It is scarcely possible to suppose that this circumstance could have escaped the observation of Huber, which has been verified by even the most common observer of the motions of bees, and yet it is attested by Rennie in the Insect Architecture as confirmatory that pollen cannot be the element of wax. The contrary, however, being confirmed, and it being established beyond the possibility of a doubt, that pollen is conveyed by a swarm into a hive on the very day of its being hived, and further, that they bring it along with them from the parent hive, all tends to throw an additional light on our hypothesis, that pollen is actually the constituent principle of wax. Let a person examine his hive on the third or fourth day after the swarm has been settled, and he will not find a single particle of the pollen deposited in any of the cells. What then has become of the great

quantity which has been carried daily and hourly, and we may add momentarily, into the hive? It has not formed any part of the food of the community; it has not been apportioned to the nourishment of the brood, for as yet there has not been any to nourish: let him, however, kill half a dozen of the bees, and he will find the pollen in the second stomach of the bee in a state of elaboration, and in some of them in a state of readiness to be worked into wax. One of the chief arguments against this use of pollen is, that the bees are seen to carry it in great quantity into those hives, the combs of which are completed, and thence the deduction is made, that as the bees do not require it for wax, they must apply it to some other purpose, or, in other words, that it cannot be the element of wax. We confess that we never could comprehend the intent of the bees in amassing such a large quantity of a material, of which apparently they do not make any use; and it is further an undisputed point, that the older the hive, the more intent the bees appear to be in the amassing of it. It is also a curious fact, that the bees seem to be so conscious of its liability to corruption, that they never entirely fill a cell with it, but having half filled it, they, for the purpose of excluding the air from it, fill the remainder with honey. It must, however, be admitted, that the objection loses a great deal of its force, when it is considered that the pollen, not being elaborated into wax, is found in its crude state in the hive, but that whilst the process of wax-making is going on, none whatever is found. Huber in one place describes the pollen as the food of the bees, as well as the aliment of the brood, but in the great number of hives that we have seen perish in the winter for want of food, there has always been found a considerable quantity of pollen or bee-bread, and therefore it may be considered as an incontrovertible fact, that it forms no part of the sustenance of the bee.

If, however, we examine the theory of Huber a little

further, we find that he declares the cells at their formation to be a *dull* white colour, and that in a few days they become yellow, which colour he affirms arises, particularly round the orifices of the cells, from the bees having employed a different substance in their formation, viz. propolis, and not wax. He, however, directly afterwards contradicts himself, and says, that this yellow colour is not imparted by propolis, and, in fact, he hesitates not to confess that he does not know what it is. In default of arriving at a certainty, the next best step is undoubtedly an appeal to conjecture; and accordingly, Huber conjectures, that it is not produced by the heat of the hive, but that it may be ascribed to "the bees rubbing their feet, teeth, and other parts of their body on the surface when they seem to rest."

Now we will put the question to Messrs. Kirby and Rennie, whether, on examining the combs of a swarm about a week after it has been settled, they be not found of a yellowish tinge? and this proceeds, in the first place, from the interior heat of the hive, and that colour becomes deeper and deeper, until at last it appears as a deep black; and yet Huber, the highly vaunted experienced Huber, says, that he does not know why the edge of the orifice of the cells is of a deeper colour than the cell itself. The cause, however, of this, to Huber, unaccountable phenomenon, is obvious to the meanest capacity. The cell itself being a simple scale of wax, is purely white; whereas the edge of the cell, which may be called a layer of scales, and consequently more opaque, assumes a deeper and yellowish tinge, and such is the case with all colours where the substance increases in thickness. Independently of which, the orifices of the cells by the continual travel of the bees over them, and their more immediate exposure to the heat of the hive, assumes a deeper colour than the interior of the cell, which is not subject to any exterior action or exposure.

Treating of the formation of wax, L'Abbé della Rocca says,

"Supposing the bees to form the wax from the pollen, it is necessary that it should be digested in the stomach of the bee," but this he positively denies to be the case; and he founds his opinion on the result of the experiments of Mr. Geer, who, in his Memoir on Insects, says, "According to the opinion of all chemists, it is impossible to effect the decomposition of wax in any manner whatsoever, even if the same means be employed as in the decomposition of stones or metals; from which it is apparent that the strongest stomach cannot digest it, excepting that of the wax-moth. But if the stomach of the bee possesses the strength to transform the pollen into wax, I do not see why another stomach, equally hot, or some particular chemical process, could not produce the same result."

There is something very confused in the above passage, for it ought not to be alleged as a proof that the stomach of the bee is not strong enough to elaborate the pollen, because the result of that elaboration is an indigestible substance. Experience has determined, and the circumstance may be verified at pleasure, that pollen is digested in the stomach of the bee; and as there is not any duct by which it can be voided as an excremental matter, it becomes a natural deduction, that on the elaboration having attained a certain degree of perfection, it is emitted in that white ropy matter which constitutes the wax of the combs.

Reaumur instituted several experiments with the view of ascertaining, if it were not possible by art to extract real wax from the pollen of plants, but all his experiments tended only to convince him of the impossibility of the case, and that he might as well attempt to make chyle from the substances which serve us for food, or to make silk by distilling the leaves of the mulberry tree.

Considering that the majority of the French naturalists acknowledge the farina or pollen of plants to be the element of wax, our surprise was boundless to find the following

statement relative to the nature and properties of pollen promulgated by so experienced an apiarian as Mr. Ducouedic, and which throws all the boasted discoveries of Huber far into the back-ground. We will translate the passage literally from his *Ruche pyramidale*, page 117 :—

"In fine weather the bees are to be observed loaded with farina, conveying it in its crude state into the hive. It may be looked upon on the part of the bees as a *superfluity of booty*, and almost as a supererogation of their duty. It is, however, prepared by the nurse bees for the nourishment of the brood. This pollen, which is consumed by them, *becomes honey, wax, or propolis, accordingly as the demand for the different substances requires it. The pollen is therefore what may be properly called a portion of the nourishment of the bees, and is one of the elements of honey, wax, and propolis.* It is a saccharine substance, transported in its crude state into the hive by a certain number of working bees of the most greedy disposition, who not being contented with having filled their first stomach, also load the triangular cavities which they have on their hinder legs. The much talked of crude wax does not exist in nature, *and the pollen is in reality nothing more than a balsamic substance, which is converted into honey.* I even believe that this substance, before changing its nature, may be a sort of a feast for the bees of the interior, who subsist in general only on honey, or it may be a balsamic remedy, necessary for the preservation of the health of the bees in the interior of the hive, and finally, it is only in these relations that pollen ought to be considered."

We do not know in what light to consider the author of this theory, for perhaps a more crude and undigested one was never promulgated by any individual having the slightest pretension to scientific knowledge. The mere inclination to promulgate a system differing from all others, and which is at variance with all experience, certainly cannot have led him

into the dissemination of so preposterous a doctrine as that which is contained in his definition of the nature of pollen. It requires very little proficiency in natural history to know that the farina of plants, and the saccharine juices secreted at the bottom of their pistils or nectarium, are two distinct and heterogeneous matters. No act nor elaboration in the stomach of the bee can possibly convert the farina into honey. There is no affinity whatever in the two substances; and when it is experimentally proved that honey exists in nature as an individual substance, and is to be found by the bee in projecting its proboscis to the bottom of the pistil of the flower, we cannot but conceive that the most direct ignorance could alone have prompted any individual to disseminate so wild and improbable a story, as that farina is the fundamental element of honey. Were pollen analyzed into one hundred parts, we do not believe that it would contain five of saccharine matter. In its constitution it is diametrically opposite, nor can any analogy with honey be found by the profoundest skill of the chemist, or the elaborate internal powers of the bee.

In the *Encyclopédie Méthodique*, under the article "Bee," we find the following observations on the origin of wax:—

"If any reliance is to be placed on the most exact observations, wax is contained in the stamina of the flowers. M. Bernard de Jussieu, a man of science, and who would not suffer himself to be easily imposed upon, asserts this fact after the most minute experiments. The grains of the farina of the stamina, which he put into water, swelled until they burst. At the time when one of these grains burst, there resulted from it a little globule of an oily and unctuous liquor, which floated on the water, without ever incorporating with it. I have repeated this experiment a number of times, and with the same success; but I do not believe that it is sufficient to prove that the matter, which is destined by

nature for the production of the species, is that which serves for the formation of wax, although it may contain the principles. I procured for Mr. Fourcroy a great quantity of the farina from the stamina of hemp, but he was never able to extract any wax from it."

I am convinced, says l'Abbé della Rocca, that the bees which we see on the branches and the leaves of the fig tree, are employed only in amassing the exudations of wax, which are visibly perceptible flowing on those trees, and even on the figs, round the openings of which are seen small globules f an unctuous matter, and from which even the honey is seen to flow.

The Father Hardouin relates a certain circumstance in his notes on Pliny, which tends in some degree to confirm this observation of the Abbé. Ex olea ceram apes carpere Varro docet, lib. iii. de Re Rustica, cap. xvi. pag. 114. Non ex flore quidem, ut Plinius rectè observat, lib. xxi. sect. 41. sed ex frondium partibus, quæ cum crassiores sint quàm florium, ceræ fingendæ videntur esse accommodatiores. Id a se visum, observatumque sæpius, scribit Albertus, lib. viii. de Animal. Tract. iv. cap. iii. p. 268.

TWENTIETH CHAPTER.

ON THE NATURE OF PROPOLIS.

THE HYPOTHESIS OF HUBER RELATIVE TO THE NATURE AND ORIGIN OF PROPOLIS NOT FOUNDED ON TRUTH—SUPPOSED TO BE GATHERED FROM CERTAIN PLANTS—THE CELLS OF THE BEES LINED AND SOLDERED WITH PROPOLIS—ARGUMENTS AGAINST THAT HYPOTHESIS—EXPERIMENTS TO DETERMINE THE AFFINITY OF WAX AND PROPOLIS—PROPOLIS A VEGETABLE SUBSTANCE — WAX AN ANIMAL SUBSTANCE — EXPERIMENT TO DETERMINE THE NATURE OF PROPOLIS—NOT CARRIED INTO THE HIVE AS A SEPARATE SUBSTANCE—THE EFFECT OF TEMPERATURE UPON IT—POSITION OF THE BEES CONSTRUCTING A COMB — THE FOUNDATION OF A COMB DETERMINED TO BE WAX — EXPERIMENT TO DETERMINE THE EXISTENCE OF TWO SEPARATE SUBSTANCES—CONCLUDING REFLECTIONS.

It is the opinion of Mr. Rennie, that Huber has, by the depth of his researches, set at rest the important question touching the nature and origin of propolis: in opposition, however, to that opinion of Mr. Rennie, we venture to affirm, that the hypothesis advanced by Huber relative to that substance has no foundation whatever in truth. It is primarily worthy of observation, that the existence of propolis in a hive as a separate substance is now entirely exploded by the French apiarians, by whom it is called *cire forte,* or *cire brune.* It is, in fact, wax itself in all its constituent principles, and only differing in appearance and colour from the wax of the combs, on account of the apparently coarse and rude manner in which it is worked by the bees, divesting it of that comparatively transparent property which appertains to the more attenuated wax with which the combs are constructed. From the deepened colour and opacity of propolis, the superficial observer is very apt to be misled, and be induced to draw the conclusion, that a positively natural difference exists between pro-

polis and wax. So far from propolis, however, having any homogeneity with wax, Mr. Huber has decided the point to the entire satisfaction of Kirby, Rennie, and a few others, that the former is a positive genuine production of nature, and not *made*, but collected by the bees from the leaves and branches of certain shrubs and trees, the principal one of which Kirby and Spence consider to be the tacamahac. According to Huber, the bees have been observed to draw out long threads of this viscous substance, and to lodge them in the cavities of their legs, and as soon as one bee had completed his load, another bee was very conveniently at hand to continue the loading system, until a sufficient quantity had been obtained. They then began to knead and work it like an Irish labourer does a heap of mortar, and when in a proper state of attenuation, they proceeded to line and solder their cells. It is really lamentable, that an assertion like the latter, which can be immediately refuted by the inspection of a piece of honey-comb, should have received the sanction of any of the naturalists of this country, and have been actually disseminated as belonging to the physiology of the bee. Did ever Kirby or Rennie impose upon themselves the task of verifying the assertion of Huber by a close and rigid examination of a piece of comb in any given stage of its age or growth? and can either of them present himself before the public, or before the Committee of the Society for the Diffusion of Useful Knowledge, with the vouchers in his hands, that from his own experience, the hypothesis of Huber has been reduced to truth, and that this lining and soldering of the cells with propolis constitutes an established and invariable principle of action of the working bee in the construction of its cell? It is scarcely possible to fix upon an elaborated substance more finely or beautifully attenuated than the sides of the cell of a bee; in its thickness it is not the hundredth part of a line, and is composed simply of wax in its uttermost tenuity. Were, however, the sides of the cells to

be lined and soldered with the threads of the propolis, as described by Huber, their transparency would be wholly destroyed. The capacity of the cell would be so contracted, that it would not be fit for the general purposes to which it is applied; and instead of a light gossamer transparent substance, the combs would present a dense and opaque appearance, wholly dissimilar to that which a comb always exhibits, previously to the honey being deposited in it. There is, however, one difficulty attending this lining and soldering of the cell with propolis, from which the partizans of Mr. Huber will find it difficult to emancipate themselves. We have the authority of Huber for the affirmation, that propolis is not wax; the latter, according to his experience, being a fabricated substance from honey; the former being a natural one, we are not even to suppose that the slightest affinity exists between them, but that they are in their constituent principles wholly dissimilar and hetereogeneous. In what manner, however, will the advocates of Huber account for the circumstance, that if a comb be taken and subjected to the process of ebullition, the result is a mass of wax corresponding very nearly to the weight of the comb, excepting where the combs have abounded with bee-bread, which at once declares itself, with perhaps some abortive brood intermingled, in the residuum? If, however, the cells be lined and soldered with propolis, according to the statement of Huber, what becomes of this substance when the comb is subject to ebullition? It is not the mere process of boiling which can convert that substance into wax, which was not wax previously to its being subjected to the action of heat, nor must it be pretended that an amalgamation of the two substances can take place, and that by such incorporation, the propolis acquires the properties of wax, or that it becomes virtually and intrinsically wax itself. The unctuous nature of wax prevents its incorporation with the water in which it is boiled, and therefore the bee-bread,

being entirely a vegetable substance, without the admixture of any foreign matter, becomes naturally separated from the wax, and constitutes the residuum at the bottom of the vessel. Propolis is, however, according to Huber, a distinct vegetable substance; on the other hand, wax is decidedly an animal substance: the former is collected by the bees, the latter is an exudation; and yet these two heterogeneous substances shall, by the simple effect of ebullition, be converted into one and the same substance.

Simple and easy, however, is the method of arriving at the truth of the real nature of the propolis. Let a person at any time take a given quantity from a hive, and submit it to ebullition, and the result will be a piece of wax nearly of the same weight, although of rather a darker hue than that which is produced from the combs alone; in fact, the notion ought to be wholly exploded of the existence of two distinct substances in the hive, one of which has hitherto been distinguished by the name of propolis.

There is another circumstance by no means undeserving of attention, and which will of itself go a great way to invalidate the hypothesis of Huber respecting propolis, which is, that no person ever yet witnessed a bee carrying this substance into the hive. Huber, however, declares, that he observed the bees attaching the viscous exudation of the birch, poplar, and other trees to the cavities of their legs, which exudation, he determines to be propolis; and further, that he was an eye-witness of the use, which they made of it. During the whole of our experience, however, in the results of which we are confirmed by others, who have made the physiology of the bee their particular study, we never witnessed the bee carrying any other substance in the cavities of its legs, than the pollen of the flower. This, indeed, varies in colour from the dingy white to the deep brown; and it was the latter circumstance, perhaps, which instilled into the minds of the earlier apiarians, as well as of Huber, the no-

tion of the existence of a substance differing from wax. We, however, discredit the statement altogether of the bees carrying any substance into the hive which is made use of in its natural state, with the exception of honey, as an article of food; in fact, the application of propolis in its crude state, as it is gathered by the bee, to any particular use in the hive, carries with it its own refutation; for it is a problem not easily solved, in what manner a direct vegetable substance can, by its simple transportation from one place to another, acquire certain qualities and virtues, which it did not possess in its natural state. It would be consistent with experience to suppose that the transportation of a glutinous substance, from a colder to a warmer temperature, would render its tenuity still greater; but in the present instance, that principle of action appears to be reversed, for on being brought into a warmer temperature, such as the interior of a hive, the substance assumes a hardness and consistency which belonged not to it in its natural state, but which could not be produced by the simple agency of heat; on the contrary, it would become more thin and ductile.

The result of the following experiment will, it is presumed, invalidate the hypothesis of the existence of propolis as a distinct and natural substance.

We placed a small hive on the top of one of our most populous stocks, and we took the opportunity of examining minutely the bodies of the bees employed in the construction of the new combs, for the express purpose of ascertaining the existence of any scales of wax, which, as the formation of the combs was then going on, ought, according to the theory of Huber, to be secreted between the rings of the abdomen. Having convinced ourselves that the bees had commenced the combs at the top of the hive, we closed all access to it from the lower hive, and taking the upper hive away, we had then about three hundred workers on whom to perform the experiment. The bees, at the mo-

ment when we took the hive away, were gathered in a cluster at the top of the hive, in an elongated form, similar to that which is seen before a hive previously to its swarming, and which the French call *une barbe.*

This position, which is natural, and it may be added, universal to the bee during the process of the construction of the combs, undoubtedly gave rise to the fanciful festoons and curtains of Huber, which we have already described. At the time of our inspection, the new comb, white as snow, measured three inches in length, but neither honey nor eggs had yet been deposited in it. In order, however, that no disappointment might occur in the prosecution of the experiment, we gave the bees a slight fumigation, which rendered them so tractable, that the handling of them was not attended with any risk or difficulty. We now proceeded to examine each bee individually, lifting the abdominal scales with a sharp pointed instrument, but not a particle of wax was discernible. Impressed with the idea that the advocates for the formation of wax by exudation might raise the question, that in the present instance the bees might have exhausted their stock of wax in their wax pockets, and therefore that no reliance ought to be attached to the experiment, we determined to repeat it on the following day. Accordingly we again examined the hive, but whether from the annoyance which the bees had received on the preceding day, or from some other cause, not possible to be accounted for, no further progress had been made in the construction of the combs. On the third day, we again examined the hive, and perceived that a considerable progress had been made in the comb, which had increased in length an inch and a half. We also observed the foundation of another comb, which circumstance furnished us with a renewed opportunity of instituting an examination into the nature of the substance, which forms the foundation of the combs, and which is usually designated by the name of pro-

polis. We proceeded to detach from the top the whole of the substance, which exhibited a rude and shapeless mass, but in which the foundation of the infant cells was distinctly perceptible. We submitted the lump to the usual test, and the result was a genuine piece of wax, very little inferior in weight to the piece previously to its being submitted to the process of ebullition. The experiment, however, was but the repetition of many similar ones that had previously been made, and under every possible circumstance which could either verify or disprove the existence of two separate substances in a hive, namely, wax and propolis; and the result of which we consider to be, that the substance called propolis is not a natural one, gathered in its crude state by the bees, but that it is wax in all its constituent and elementary principles.

Mr. Lombard says, "That a perfect ignorance prevails regarding the matter of which propolis is made, or whence the bees extract it." This we consider as a most extraordinary confession on the part of Mr. Lombard. He should have consulted his great and infallible leader, Huber; and although the statements of that naturalist might not have been correct, still Mr. Lombard might have adopted them with the same confidence which he has so lavishly bestowed on the fortifications, the duels, the magical attitudes of the queen, her knowledge of the French language, and other of the absurdities of Huber.

TWENTY-FIRST CHAPTER.

ON THE TRANSPORTATION OF HIVES.

PROFIT RESULTING FROM THE REMOVAL OF HIVES—ADDITIONAL WEIGHT OF HIVES BY REMOVAL TO HEATH—REMOVAL OF HIVES IN SCOTLAND—OBJECTIONS TO THE REMOVAL—ADVANTAGES OF REMOVAL TO WEAK HIVES—REMOVAL OF HIVES IN THE AUTUMN AND THE SPRING—HIVES TO BE REMOVED TO THE VICINITY OF FURZE—TRANSPORTATION OF HIVES IN EGYPT—PRACTISED BY THE GREEKS AND CHINESE—PLAN ADOPTED IN PIEDMONT — MANNER OF TRANSPORTING THE HIVES IN FRANCE—RULES LAID DOWN BY M. BOMARE—DIFFERENT SYSTEMS OF REMOVAL—THE PLAN OF TRANSPORTATION DISAPPROVED BY DUCARNE—HIS OPINION EXAMINED—REMOVAL OF HIVES RECOMMENDED IN THIS COUNTRY.

When the different seasons are considered in which the flowers are in bloom from which the bees extract their honey, it is surprising that the custom of removing the hives to distant situations has not yet been practised by the English, and especially by the Scotch apiarians. The profit which would result from this practice would more than compensate for the loss of time and the trouble with which their removal would be attended. In Scotland we have experienced an addition of ten and twelve pounds of honey in every hive by its removal to the vicinity of heath, which is of particular value to the bees, as it is in bloom when almost all the other shrubs and flowers in the gardens and the fields have ceased to blow. A rich corn country is a desert to bees; and in the northern countries, and especially in the highly cultivated straths of Scotland, bounded as they are generally on each side by "heath-covered mountains," the bees should always be removed in August or September from the straths to the foot of the hills, and it may with truth be affirmed, that the proprietor will find himself amply repaid for his trouble. We have heard an objection raised by many persons to this system, founded on the difficulty of finding

a place in those remote regions, where the hives would be safe from the depredations of the robber. This difficulty is, however, very easily overcome, as is generally the case, when a sincere disposition to remove it, exhibits itself; for although the mountains themselves be but very thinly inhabited, yet at their feet there are many cottages, the owners of which would be very glad to admit some bee-hives into their kail-yards for a very trifling remuneration. During the short time of their stay, they would not require any attention from the proprietor, and having once deposited them, he need not give himself any further trouble about them, until the flowering of the heath has ceased, when the hives may be brought back again.

In the generality of cases, man is inclined to adopt that mode of action from which a promotion of his interest may be confidently expected; it is, however, strange, that although we have exposed to many apiarians the signal advantages to be derived from the removal of their hives, they have uniformly listened to us with the greatest attention; they have apparently coincided in the justness of our remarks; but the hives remained in their original position.

To a weak hive, the removal must be of peculiar advantage, and when the trifling expense which attends it is put into the scale with that, which arises from a constant feeding during the winter, independently of the great trouble with which that operation is attended, we cannot conceive any person to be so wilfully blind to his own interest, as not to adopt the system of removal.

We, however, not only recommend in the strongest terms the removal of hives in the autumn, but we would also wish to see it adopted in the spring in those places, where the bees have the advantage of furze. It is one of the most early flowering shrubs, and the farina of it is sought with the greatest avidity by the bees; the broom and the sallow are also very early in their flowering, and those shrubs are

seldom to be found in highly cultivated places. We have experienced the greatest benefit from a month's residence of our hives in the vicinity of furze and broom, especially in regard to the earliness of the swarms, and that is certainly an advantage obtained of no secondary character.

In many countries, the removal of the hives from one pasturage to another is considered as a very important branch in the practical management of the apiary. Savary, in his Letters on Egypt, enters into a long detail of the manner in which the inhabitants of that country transport their hives along the banks of the Nile. "The Egyptians," he says, "exhibit great skill in their manner of cultivating the bee, as the flowers and the harvest are much earlier in Upper Egypt than in Lower, and the inhabitants profit by this circumstance in regard to their bees. They collect the hives of different villages on large barks, and every proprietor attaches a particular mark to his hives: when the boat is loaded, the conductors descend the river slowly, stopping at all the places where they can find pasturage for the bees. After having thus spent three months on the Nile, the hives are returned to the proprietor, and after deducting a small sum due to the boatmen for having conducted his hives from one end of Egypt to the other, he finds himself on a sudden enriched with a quantity of honey and wax, which is immediately sent to the market. This species of industry procures for the Egyptians an abundance of wax and honey, and enables them to export a considerable quantity to foreign countries."

M. Maillet, in his History of Egypt, also makes mention of this custom relative to the pasturage of the bees.

It is the custom of the modern Greeks, who inhabit the coast of Asia Minor, towards the islands of the Archipelago, to transport their hives by sea in order to procure an abundance of food for their bees. A similar practice is also adopted in China; but "the celestials," of all the people in the world,

are the most ignorant in the management of the bee. Of its natural history, they know less than the savages of Africa; they consider themselves very wise in knowing that the bees make honey and wax, but as to any further research into their history, it is beneath the notice of such celestial beings.

A very ingenious method is practised by the people who inhabit the banks of the Po, in regard to the transportation of their hives. They load the boats according to the manner of the Egyptians, and then transport the hives to the vicinity of the mountains of Piedmont. On their departure, a line is marked out round the boat, from which a scale is drawn, and as the bees collect the honey, the boat sinks deeper into the water; thus, by looking at the scale, the boatmen know when the bees have gathered a sufficiency of honey, and they then prepare for their return.

Alexander de Montfort relates, that the people in the vicinity of Juliers generally convey their hives to the foot of the mountains when the wild thyme is in flower.

M. Valmont de Bomare, in his Dictionary, observes:— "Great is the advantage of being in the vicinity of a navigable river, for by these means the spring of a dry country can be united with the autumn of a fertile and umbrageous one, and thereby ample amends be made for the poverty of the country in which the apiarian may be established."

M. l'Abbé Tessier, Proutant, and others, inform us, that the proprietors of the bees in La Beauce transport their hives every year in the month of August in carts, into the country of the Gatinois, or to the environs of the forest of Orleans, about the distance of ten miles from their habitation. They find heath or buck-wheat in flower at a time when in La Beauce, after the gathering of the sainfoin and the vetches, no further addition can be made by the bees to their winter store.

This manner of transporting the bees is called in the country, *leading them to pasture.* A single cart contains

thirty or forty hives. They travel only during the night, and at a foot-pace, and as much as possible on sandy roads. The hives are covered with linen, and are arranged in stories; those of the upper being reversed between those of the lower story. They remain about two months in the place of their pasturage. The peasants take care of them for a very trifling salary. In this season nearly three thousand strong hives are seen as a little village.

When the hives are to be transported, they are placed in the evening on a linen cloth, in which they are wrapped, and tied round with bands of straw, osier, or pack-thread. Two men can carry several hives by passing a long stick through the knot of the cloth which covers them. They are thus often packed on horses or mules. If they be placed in the common way, that is, on their bottom, they must be raised and sustained at the height of some inches, especially if the journey be of some length; for it is necessary that the bees should be able to imbibe a renovated air. The swarms which have been newly hived may remain in this state two or three days. In cold weather, the hives full of wax, honey and bees, may be transported to any distance, by taking care only that the combs do not break one against the other; for this purpose they are supported with little sticks.

To these details of M. l'Abbé Tessier, we will add some not less interesting, extracted from the Dictionary of M. Bomare. "The skilful economists in the Gatinois, after the crop of sainfoin, transport their hives into the plains of La Beauce, where the melitot abounds; afterwards into Sologne, where the country is covered with buck-wheat, which is in flower until the end of September. This practice is universal in the country, and even the humble peasant imitates the opulent proprietor in the transportation of his hives."

M. Bomare adds—"We are informed, by a memoir of M. Duhamel, that the profit which is extracted from the bees under

the system of transportation is very considerable. From the month of July, when the bees have swarmed, and have made an excellent harvest from the sainfoin, the whole of the honey and wax is taken from them, and the bees are put into an empty hive. The hives are then transported into a country where an abundance of flowers and mellifluous herbs are to be found. If the weather be fine, and the flowers luxuriant, the hives, which have been transported in July, are well filled by the latter end of August. They are then changed a second time, and particular care is taken of the brood combs. As soon as the bees have been thus changed a second time, they are removed into a country in which buck-wheat abounds; and supposing the season to be avourable, the hives are so well filled that a third of their combs may be extracted."

Thus concludes M. Bomare: "By the aid of human industry, the most surprising collection of honey is obtained; but it must be confessed, that every year is not equally favourable, and that sometimes the hives can be changed only once. On the other hand, some bees are more industrious than others. I have seen a very active hive, *in the space of twenty-four hours, increase six pounds in honey and wax* *.

"In the Gatinois, sixty or seventy pounds of honey, and nearly two pounds and a half of wax, are extracted from a good hive †. The great art in this country, and which a good economist ought never to lose sight of, is to have the hives always well peopled with bees. In the countries which

* This is bordering strongly upon an Huberian miracle. A hive is reckoned in this country to be of a prime character which increases six pounds in a month; but an addition of six pounds in twenty-four hours is an incredibility.

† In the memoirs of the Royal Society of Arts, it is stated that Mr. Knight, of Great Bardfield, Essex, obtained forty-five pounds of honey, and fourteen and a half of wax, from one hive. There must be some error in this calculation. The quantity of wax is out of all proportion to that of honey, nor is it credible that such a quantity of wax could be produced from a single hive.

abound not so much with flowers, and where equal care and attention are not bestowed on their hives, the profit obtained from the bees is much less considerable. In some parts of the kingdom, a good stock of two years old may produce two pounds and a half of wax, and from twenty to thirty pounds of honey or more."

We grant that these details are interesting, and well calculated to excite in country persons and landed proprietors an active disposition to encourage the culture of the bee; but still they are not wholly satisfactory. It is not that we doubt the advantage derived from the transportation of hives into a fresh pasturage, having ourselves experienced the benefit, when it can be done without any great inconvenience or expense; but in the details just given, there is a great inaccuracy, and several very gross contradictions are manifest.

In the first place, in regard to the information of M. Bomare, extracted from the Memoirs of M. Duhamel, relative to the ample collection of honey and wax which is extracted in July from hives which have sent forth several swarms, all the bees of which are afterwards transferred into empty hives, it appears to be enveloped in great doubt. It is well known that the hives, from which two or three swarms have emigrated in the course of a month, are continually occupied with the re-peopling of the hive, as the brood combs will sufficiently testify; and if that re-peopling cannot be fully established, the hive so situated seldom survives the winter. In a climate, however, similar to that of London or Edinburgh, the bees do not in general begin to swarm before the month of June, and before the second swarm is thrown, that month is far advanced. How then can we expect to extract from those hives a sufficient crop in the month of July? much less can we expect to form a good stock by removing the bees into an empty hive.

We are further recommended to take particular care of

the brood, which ought to be very abundant in those hives which have swarmed. In answer, however, to that recommendation, we say, that it is not merely sufficient to impress that caution upon the bee-master, but that it is actually necessary to impart to him the most easy and expeditious method of succeeding in that difficult department of apiarian practice. It is further to be observed, that the chief aim of the apiarian is to have his hives well peopled; but what are the methods to be adopted in order to effect that aim? We answer, by carefully abstaining from every act which can in any manner injure or diminish the brood in the combs; and is not that very act most punctually performed by the removal of the bees from a full hive to an empty one at a season of the year when the combs abound with brood?

In regard, however, to the transportation of hives, it is but just to hear both sides of the question, and Mr. Ducarne, who has a great claim upon our consideration in all matters relative to the bee, totally disapproves of the system, and the following are the grounds on which his opinion is founded. "A friend of mine," he says, "who was a great advocate for the transportation of hives, sent them four years successively to the buck-wheat, and only in one instance did success attend him; for in the other three, the bees actually lost in their weight. The disadvantages and losses attending the removal appear also to be carefully concealed by its advocates; for they forgot, and I suppose wilfully so, to mention, that sometimes a quarter, and even half of the hives are destroyed on the journey, especially if the buck-wheat be situate more than three or four miles from the place whence they set out; for although on conducting them, every attention be paid to cover them with very fine net work, or some other substance, for the purpose of admitting plenty of air to the bees; yet, if the weather be at all hot, a great number of them die by suffocation. Another very important injury is sustained during the removal, for it

generally happens that the old hives, which have not been turned topsy-turvy, are pillaged by the others, and even sometimes by the bees, which are transported on other carriages." M. Ducarne also says, "that the honey obtained from buck-wheat is of little value, and sells for half the price of the other honey."

The objections of M. Ducarne are, however, easily answered; for, in the first place, he never tried the system of removing the hives to a fresh pasturage, and his conclusions are therefore drawn from the vague opinions of others. In regard to the circumstance, that the plan of removal only succeeded in one instance, it is very probable that in the other cases, a combination of circumstances might have taken place unfavourably to the collection of honey. Some years are certainly not favourable to the removal of hives, and if it should happen to be undertaken in any of those years, the system itself must not be blamed for the failure. The proprietor has it always in his power to make himself acquainted with the richness or poverty of the pasturage to which he is going to remove his hives; for as the secretion of the mellifluous juice depends in a great measure on the temperature of the season, it may happen, that although the extent of the pasturage be probably such as to warrant the proprietor in the expectation of a great harvest of honey, yet particular circumstances may coalesce to defeat that expectation, and with which the proprietor ought in some measure to have been acquainted, previously to the removal of the bees. We are also particularly surprised at the assertion of M. Ducarne, that the old hives are often pillaged during their removal, and on their arrival at the place of their pasturage. It is universally known, and M. Ducarne cannot have been ignorant of the fact, that the bees never take to the nefarious system of pillage as long as there is any honey to be found in the fields.

Respecting the great loss which the proprietors are said

to sustain by the removal of the hives, we are enabled positively to contradict that statement, and, in refutation of it, we can produce the testimony of some of the most skilful apiarians and naturalists. During our travels in Germany, and particularly in Hanover, we had frequently an opportunity of witnessing the travelling apiaries, and we were informed by one proprietor, who had followed that occupation for above twenty years, that he never lost a single hive by the mere casualties of the journey. Intelligent, however, as this apiarian was in many respects, and well instructed as he appeared to be in the natural history of the bee, he was a decided enemy to the system of deprivation. He universally suffocated his bees at the close of the season, although not, he confessed, until he had tried every method which different authors have recommended for the preservation of his bees. We have, however, some notion, that he entered upon the practice of saving the bees with a deeply-rooted prejudice against it; his adherence to it, therefore, would have been a matter of considerable wonder.

The great advantages attending the removal of bees afford an excellent lesson to the bee-keepers in this kingdom, especially where large rivers afford the means of easy transportation. They direct in particular the inhabitants of the rich vales, where the harvest for bees ends at an early period of the year, to remove their hives to places which abound in heath, that plant continuing in bloom during a considerable part of the autumn, and yielding a great supply of honey to the bees. Those in the neighbourhood of hills and mountains will save the bees a great deal of labour by taking also the advantage of shifting their places of abode.

TWENTY-SECOND CHAPTER.

ON THE EXTENT OF THE FLIGHT OF BEES, AND THE COUNTRIES MOST SUITABLE TO THEIR CULTURE.

IMPORTANCE OF THE QUESTION OF THE EXTENT OF THE FLIGHT OF THE BEE—ADVANTAGES OF THE PROXIMITY OF FOOD—CAUSES OF THE SHORT LIFE OF THE BEE—ESTABLISHMENT OF AN APIARY AT BRIGHTON—CAUSES OF ITS FAILURE—THE EXTENT OF THE FLIGHT OF THE BEE, ACCORDING TO THE ENCYCLOPEDISTS, DETERMINED BY THE COLOUR OF THE FARINA—EXPERIMENT TO DETERMINE THE FLIGHT OF THE BEE—VISIT TO THE ISLE OF BAS—BEES FOUND ON THE ISLAND—EXTRAORDINARY POWER OF INSTINCT IN THE BEE—OPINION OF L'ABBÉ DELLA ROCCA—ERRONEOUS OPINION OF DR. CHAMBERS AND DR. HUNTER—TRAVELLING APIARIES OF GERMANY—ERRORS IN THE CALCULATION OF A GERMAN MILE—OPINION OF HUBER—AN APIARY NOT TO BE SUPPORTED BY ARTIFICIAL MEANS—CULTIVATED FLOWERS OF LITTLE USE TO THE BEE—THE PARTICULAR PRODUCE OF A COUNTRY TO BE STUDIED BY EVERY KEEPER OF BEES—NUMBER OF HIVES WHICH ANY GIVEN TRACT OF COUNTRY CAN MAINTAIN—DANGER OF OVERSTOCKING A COUNTRY WITH HIVES—AVERAGE NUMBER OF HIVES OF THE ENGLISH APIARIES—EXTENSIVE APIARY AT COBHAM, IN KENT—ECCENTRIC CONDUCT OF THE PROPRIETOR—EXTENT OF THE NUMBER OF HIVES TO BE KEPT IN ANY APIARY—OPINION OF M. LA GRENÉE—THE SAME REFUTED—ANALOGY BETWEEN CATTLE AND HIVES OF BEES.

The question of the distance to which a bee can extend its flight, is not of that minor importance which some persons may be disposed to attach to it, and it is from a total neglect of or indifference to it, that the ruin of many an apiary is to be attributed. It may also be confidently affirmed, that the comparative excellence of the position of an apiary depends in a great measure on the greater or less distance, which the bees have to fly for their food; for it is a rational deduction, that the bees, who have to travel three or four miles to the fields of their pasture, cannot collect an equal quantity of honey with those, who have to travel only half a mile; as the latter can make four journeys whilst the former can only make one, independently of the consequent risk which the bees incur who have to travel to a great distance, by having to cross rivers and lakes, and of being dashed into them by the

wind, or destroyed by some of those other numerous accidents to which the bees are so liable.

It has been ascertained, that the bees of an apiary, whose fields of pasture are situate at a distance, are much shorter lived than those, whose food is in the immediate vicinity; and this arises chiefly from two causes: first, the various dangers to which their longer flights expose them; and secondly, to the wear and tear of their wings, which in the end become so torn and lacerated, that the bees can no longer prosecute their labours, and they either die in the fields, or from hunger in the hive. We had a very striking proof of the truth of the foregoing remarks in the establishment of a small apiary in the vicinity of Brighton for the late Sir Thomas Clarges, in whom we lost a truly enthusiastic advocate for the culture of the bee*. The immediate environs of the town being composed of mere down lands, little or no food could be found for the bees, with the exception of a scanty supply, which could be gathered from the few straggling flowers cultivated in the gardens in the immediate vicinity of the place. The consequence of which was, that although the bees contrived to gain a scanty subsistence, yet we could not succeed in a single instance in obtaining more than one or two pounds of honey from each hive, the bees being in the Huish hive; and even that small portion which was taken from them was done at the risk of them perishing in the winter for want of food. Finding the situation so very bad for an apiary, we had the hives removed to a cottager's

* We were sent by this truly eminent lover of science to his estates in Lincolnshire, Nottinghamshire, and Yorkshire, for the purpose of establishing the culture of the bee amongst his tenantry, and we enjoyed every prospect of success; when, unfortunately, his property being under trust, it was considered by the trustees, the late Bishop of Durham and Mr. Morland the banker, that such a laudable attempt on the part of Sir Thomas was an unjustifiable interference in the management of the estates; and, therefore, we received through their solicitor a polite intimation, that the knowledge of the management of bees was by no means necessary to enable the tenants, and particularly the cottagers, to pay their rent.

garden at Pagham, where they throve remarkably well, and yielded a rich harvest of honey.

It has been stated by some of the encyclopedists, that the flight of a bee extends to four miles, and this is said to have been determined by the colour of the farina of certain plants being seen on the legs of the bees, which did not grow within the distance of four miles from the apiary. We, however, consider this criterion to be very defective and indefinite, for the colour of the farina of plants varies so little in its shade, being almost universally of a yellowish tinge, that it would almost amount to an impossibility to determine the particular flowers from which it is gathered. It is true that we have seen the pellets of farina on the legs of a bee of a dark slaty colour, but it would be at best arriving at a random kind of a conclusion to determine the extent of the flight of the bee from the mere colour of the farina, unless it had been unequivocally ascertained, that no flowers whatever flourished in the immediate neighbourhood from which the farina of such a particular colour could be obtained. We had once an apiary situate about three miles from a range of hills which were covered with heath, and knowing the richness of that shrub in honey, we purposed removing our hives to the immediate vicinity of so rich a pasturage. Previously, however, to our undertaking the transportation of the hives, we determined to ascertain whether the heath was within the range of the flight of our bees, for which purpose we adopted the following expedient. We put some flour in a small pepper-castor, and proceeded to the hills, leaving a person with the hives to keep a strict watch upon them, with the view of ascertaining whether any bees returned to the hives sprinkled with flour. We were not many minutes at the hills before we discovered a number of bees collecting the honey, every one of which we besprinkled well with the flour. On our return home, we were informed that a considerable number of bees had re-

turned with the sprinklings of the flour, and in fact some of them with their miller's jackets on were observed to leave the hive again, and dart away in the direction of the hills. Thus the fact was indisputably ascertained, that the rich pasturage, although full three miles distant, was within the range of the flight of our bees, and therefore we desisted from our project of removing them. Another corroborative proof of the extent of the flight of the bee was obtained during an excursion which we made with Bonner to the Isle of Bas, at the entrance of the Firth of Forth, which is mostly covered with heath, and on which, to our great surprise, we saw a number of bees collecting their honey. As not a single hive was kept on the island, it was clear that the bees must have winged their way over the water either from the Lothians, or the coast of Fife, the former being about four miles, the latter about eight miles distant. We felt a great desire to ascertain from what quarter the bees had arrived at the Isle of Bas, but the solution of the question was attended with such almost insuperable difficulties, that we were obliged to relinquish our project. We had, however, so far ascertained the point, that the bee will fly above four miles in search of food, and not over even a campaign country, but over the very waves of the ocean. What a most wonderful instinct must that be, which can teach an insect to direct its flight, to the distance of four miles, over an expanse of water in search of its food, of the existence of which even it cannot be supposed to possess any knowledge! L'Abbé della Rocca indeed says, that it is the sense of smell which guides the bee to its distant fields of pasture, and in many respects we coincide in the opinion of the worthy Abbé, for certainly nothing can be more acute and powerful than the sense of smell in the bee. In other respects, however, it exceeds our belief, that the sense of smell can possibly be so acute as to direct the bee to an uninhabited island, situate nearly five miles from the main

land, to collect its honey from the flowers of a shrub which at no time emit any exquisite odour, and which must necessarily be neutralized, if not wholly destroyed, by the saline exhalations of the ocean.

It was the opinion of Dr. Chambers, that the bee cannot extend its flight much beyond a mile *, and Dr. Hunter was of the same opinion: we are, however, inclined to believe that both Chambers and Hunter adopted their opinion on the authority of Schirach, who affirms that the bees cannot extend their flight beyond *one mile;* but then it should be taken into consideration, that the German mile of Schirach is equal to about three and a half miles English, and from that very circumstance may be traced all the errors which the numerous commentators, both French and English, on the works of the German apiarians, have fallen into in calculating the extent of the flight of a bee. The travelling apiaries of Germany, particularly those of Hanover, are regulated by the prevailing opinion, that the bee can and does extend its flight to four and even five miles; and acting upon that supposition, when the bee-masters move their apiaries, they always travel about two *stunden*, that is, about eight miles, as they then calculate that the bees are beyond the former range of their pasture by four miles. A travelling apiary of eighty or one hundred hives will exhaust the food within the area of a circle of four miles in about a fortnight or three weeks; it is, however, a remarkable circumstance, that the honey collected *solely* from heath, without the admixture of the produce of any other flowers, is of an unpleasant flavour, and of a dark, muddy colour; in fact, in commerce, the worst kind of honey is known by the name of heath honey, and the most adulterated that is brought to market, for

* In a work lately published by Mr. A. Martin, of Corbeille, in France, he limits the flight of the bee to three or four kilometres, that is, about half or three quarters of a mile. This is one of the points in which we are decidedly at variance with Mr. Martin, for were the flight of the bee to be confined within such narrow limits, no apiary ought to consist of more than five hives.

which reason the honey of Germany bears in our markets the most inferior price.

It was the opinion of Huber, that the radii of the circle of the flight of the bee extend beyond *one mile*, but the translator of Huber has in the promulgation of that opinion fallen into the same error as the adherents of Schirach. It certainly stands in the original of Huber as *eine Meile;* but then a mile of Huber is equal to nearly four English, and thus is Huber made to disseminate an error from the culpable ignorance of the translator, which is a gross impeachment of his own judgment.

It cannot for a moment admit of a doubt, that all positions are not equally favourable to the culture of the bee, and we wish to impress it strongly on the mind of every keeper of bees, that it is a hopeless task to attempt to support an apiary by artificial means; that is, by the sowing and planting of a few flowers and shrubs in the immediate vicinity of the bees, from which they are known to collect their honey and farina. The bee in general despises all cultivated flowers, and will pass by them with disdain to luxuriate on the common furze, the broom, the willow, the hawthorn, or the blackberry of our common hedges. We do not hereby mean to dissuade the bee-master from cultivating in his garden and grounds those shrubs and flowers from which the bees derive their nourishment; but a hedge of furze and broom, or a field of wild mustard or white clover, commonly called cow-grass, is higher appreciated by the bees, than all the flowers which bloom in a garden; in fact, the most commonly cultivated flowers of our gardens, such as the rose, the pink, the carnation, the dahlia, the chrysanthemum, the hyacinth, the auricula, the polyanthus, &c. are all despised by the bee, and passed by as utterly unworthy of its notice.

The knowledge of the particular produce of a country, its localities, and the greater or less extent of its cultivation,

ought to form a part of the study of every keeper of bees. A highly cultivated country is by no means beneficial to the bee, for as soon as the harvests are got in, the fields are a complete desert to the bee. A country that is not intersected with hedges is equally unfavourable, for it is from them that the bees collect the greater part of their provisions. The hedges in general abound with the blackberry, the furze, the broom, the wild-rose, the marsh-mallows, &c. &c. independently of the rows of elm *, oak, horse-chestnut, lime, &c., from all of which the bees collect a considerable quantity of honey and farina. The fields studded with the useless daisy are a desert to the bee; but it is the fields which are whitened with the buck-wheat, the plains which are gilded with the flower of the wild mustard, the turnip, and the whole of the brassica tribe, that furnish the bees with a continual supply of food, and in which they love to disport, leaving the gaudy flowers of the garden "to waste their sweetness on the desert air."

In regard to the number of hives which any particular tract of country can maintain, various and conflicting opinions have been hazarded; for whilst some consider that a country cannot be overstocked on account of the supposed inexhaustible supply of food which the vegetable kingdom is continually producing and reproducing; others maintain, and with a greater show of reason, that analogically considered, a country may be overstocked with bees on the

* M. Buchoz affirms, that the farina of the elm, the elder, the lime, and the acacia, is injurious to the bees; but he furnishes us with no other ground for the truth of the assertion than his own words. M. Buchoz should also have mentioned the manner in which it is injurious to the bees, for it is well known that the four above mentioned trees yield little or no honey, although, with the exception of the elder, which, by the by, is not much visited by the bees, they are all excessively abundant in farina. So far from considering the elm, the lime, and the acacia as being prejudicial to the bees, we always look upon the vicinity of those trees as a great and valuable acquisition to the apiary.

same principle that a field may be overstocked with cattle, and therefore that in every species of stock, the number ought to be restricted to the means of subsistence. We certainly have no reason to fear that any part of this country will be overstocked with bees, for we scruple not to affirm, that where one hive is now kept, fifty might be kept without running any risk of overstocking the country. The average number of hives in the apiaries of this country do not exceed five, and we know of only one apiary which ever reached the number of sixty, and that was at Cobham, in Kent. The proprietor however was a perfect charlatan in bee-keeping; the aspect of his hives was not of the slightest consideration to him, for they faced all the points of the compass; and to attempt to instil any instruction into him relative to the improved method of keeping bees, was similar to driving a gimlet into a block of marble. We were introduced to this most eccentric of all bee-masters by the late Mr. Stevenson, the steward of the Earl of Darnley, and on beginning to expatiate with him on several instances of his bad management in his apiary, he very coolly insisted that Mr. Stevenson and myself should leave his premises, for, according to his own opinion, he was the only man in England who really understood the management of bees. Nothing could give him greater offence than to ask him to sell a hive, for he had formed a resolution to die with an apiary of one hundred hives. At his death, however, his apiary amounted to only forty hives; and may not this be adduced as a proof that he had over-stocked the particular district in which he lived?

There are very few districts which will support an apiary of sixty hives in one position. Twenty-five hives are the utmost which we would recommend any bee-master to keep in one apiary, with a view to actual profit; and even that number is too great, if the country be not of the first-rate

character. The better practice is, to keep rather too few than too many; and it will be found, on experiment, that ten hives in certain situations will generally yield as much as twenty. It was, it is true, the opinion of M. La Grenée, whose character stands high in the rank of apiarians, that any given district can maintain an unlimited number of hives, but neither experience nor reason will bear him out in his hypothesis. It must be granted, that every district, however rich and abundant it may be in the flowers from which the bees collect their provisions, still has its limits of supply; and consequently, if a certain number of hives be kept in a district which can consume that supply, and which is not greater than they require, any further addition to the number of hives must be attended with the greatest injury.

We will now mention those positions which are most proper and advantageous for the culture of the bee, and they may be divided into three; the first middling, the second good, and the third excellent. These three positions may be distinguished as yielding three different productions.

The corn-fields, the meadows, with little rivulets, are what may be denominated the middling position.

The proximity of woods—abundance of meadow and arable ground, extensive commons and rivulets, form the good position.

The vicinity of meadows of heath, woods, great commons and hills covered with odoriferous herbs, removed from lakes and rivers of great extent, may be denominated the excellent position: the latter will produce four times as much as the first, and will double the second. Although these positions may be considered as the best, there are nevertheless other places where hives might be placed to advantage, but not in that number which might be wished. The quality of the country in which a person fixes his apiary

should be examined, and he should regulate the number of the hives to the quantity of food which the district can produce, and not place a hundred hives in a place which can only maintain fifty.

Respecting the number of hives which may be kept in a middling district, we conceive that one hundred are perfectly sufficient; two hundred in a good one, and four or five hundred in an excellent one. In regard to those provinces that we have mentioned, in which, from their high state of cultivation, the harvest of honey ceases in August, they may still be proper for the culture of the bee, although not to that extent as in the positions previously quoted.

Huber, speaking of the advantages of particular positions for an apiary, says, that at the epoch of the Revolution he lived at Cour, near Lausanne; on one side was the lake, and on the other vineyards. He soon perceived the disadvantages of his situation. When the orchards of Cour were out of blossom, and the few neighbouring meadows mowed, he perceived that the provisions of the mother hive diminished daily; the labours of his swarms ceased to that degree, that his bees would have died from hunger in the summer, if he had not supported them; and his apiary, which had taken him years to collect, was entirely ruined.

Whilst his hives were thus going to destruction at Cour, the bees of Renan, of Chablière, of the woods of Vaux, Cery, &c., places situated about eight miles from Cour, without any lakes, woods, or mountains intervening, lived in the greatest abundance, threw numerous swarms, and filled their hives with wax and honey. If my bees, says Mr. Huber, could have cleared the interval which separated them from the places where they could have found provisions, they would certainly have done it, rather than die from hunger. They did not succeed better at Vevay,

although the distance is not quite six miles from Vevay to Hauteville, Chardenne, where the bees flourished particularly well.

In concluding this article, we regret to say, that from the present degraded state of the culture of the bee in this country, there is no fear of its being overstocked with hives. The climate of this country is particularly congenial to the multiplication of bees, but we are either not aware of the profit attending their culture, or some old-rooted prejudices are required to be extirpated, before the attention of the agriculturists can be invited to this important branch of rural economy.

TWENTY-THIRD CHAPTER.

THE BEE-MASTER'S MONTHLY MANUAL.

JANUARY.

The bees will be more or less active this month, according to the openness of the season. Should the bees be seen on a fine day flying abroad in great numbers, and making a humming noise, a just opinion may be formed that the hives are in good health, and the less they are molested, the better. Should, however, any accident occur which renders it necessary to inspect the interior of the hive, let it be an invariable principle to choose a fine dry day for the purpose, for humidity destroys more hives than cold.

Particular attention should be paid in brushing off the snow from the hives. Never permit it to dissolve upon them, for it will in many instances penetrate to the interior, spoiling the combs, and forcing the bees to forsake the hive.

The comparative degree of health can, in a great degree, be ascertained by the symptoms of anger, which are displayed on lifting up the hive. If a rustling noise be heard amongst the bees, and a sudden jerking of the wings be observed, it may be concluded that the community are in good health. The odour which issues from the hive immediately on raising it, is a very just criterion by which to judge of the health of the bees. It is, however, difficult to describe the distinctive properties of that odour, and the only sure method for the inexperienced apiarian is, to draw

the comparison between the odour of a diseased hive and that of a healthy one; the former partaking strongly of the smell of putrefied objects, the latter resembling the smell of heated wax, partaking at the same time of the fragrance of honey. If some blackish spots, resembling small linseed, be perceptible on the stool in a state of desiccation, it may then be considered as certain that the bees are in an unwholesome state. No time should then be lost in administering to them some food, in which an extra quantity of salt has been mixed, with a glass of port wine; but should that not be within the reach of the bee-master, some diluted brandy will be equally efficacious.

This malady of the bees arises frequently from the honey being deposited in old and imperfect combs, which, turning acid, occasions that disorder in the digestive organs which ends at last in the dysentery. Another cause is the old and musty bee-bread, which is the usual concomitant of old combs. Nature has indeed wisely taught the bee to provide against the bad effects of putrid bee-bread, by the particular art which it displays in filling a cell, one half with bee-bread, and the other half with honey, thereby in some degree providing against the admission of air to the bee-bread; but the honey itself becomes in time contaminated by the deleterious nature of the bee-bread, which has been kept for a long time in the cells, and unless due vigilance be used on the part of the apiarian, the destruction of his hives will be the consequence. It is very difficult to prescribe any method by which the infected combs can be removed from the common hive; for how is a person not over-skilled in the operative departments of the science, or perhaps not skilled at all, to penetrate to the top of a common hive, for the purpose of divesting it of a piece of infected comb? how is he indeed able to ascertain in what particular part of the hive the infected combs are actually to be found? and, perhaps, after having cut out one comb, he may find himself

in the situation of the dentist, who, through ignorance, has extracted the sound tooth for the unsound one. Thus the common straw hive presents those insuperable difficulties to the proper management of bees—and indeed the same may be said of every hive that does not afford access to the combs at the top—that we are not so much surprised at the smallness of the success which the cottagers have in this, to them, most interesting branch of profit, but our surprise is great, that they have any success at all. They cannot be supposed to possess an intuitive knowledge of all the minutiæ of the science in its practical departments, and all the skill which they do possess, and with which they appear to be quite satisfied, has been inherited from their grandmothers and great grandmothers, who in their dotage concluded, that if they placed their hives in a garden, they had nothing more to do than to watch the swarms, and then to suffocate them; and should any natural defect or accident befal their hives, their own want of skill and bad management were the very last things that ever entered their heads.

FEBRUARY.

This may be considered as the first month in the year in which the regular labour of the bee is to be observed. The crocus, the furze, and the sallow are now in bloom, and tempt the bee on the first indication of genial weather to resume its labours. It must, however, be taken into consideration, that the flowers, which are now in bloom, yield little or no honey; the bees are to a certain degree roused from the torpor of the winter, and the consumption of food in the hive becomes considerable. In the common hive, however, it is only a very skilful person who can ascertain the actual existence, or the quantity of food in the hive, by ocular examination. A vague idea may indeed be formed by the weight, but in an old hive it is a very fallacious

criterion, on account of the superfluity of bee-bread, which is universally found in hives of two or three years standing. Thus, many persons are deceived into a false security in regard to the internal state of their hives, and a slow but a certain ruin is the consequence. If, on examination, a number of cells be seen sealed up, it may be safely concluded, that the bees are not actually in want of food. We, however, strenuously advise every one to take the advantage of a fine day, and administer a plate full of syrup to every hive. Be not deterred by the ridiculous notion, that feeding bees makes them lazy; the contrary will always be found to be the case, and it will tend to accelerate the swarms, by encouraging the queen to begin the laying of her eggs at an earlier period than she otherwise would have done.

The stools must be this month cleansed of all the dirt which may have accumulated during the winter, and the board sprinkled with salt.

The entrance to the hive may this month be a little enlarged, and in the middle of the day, when the sun shines brightly, both the tin sliders may be drawn up; for as the bees, supposing them to be in a healthy state, will now take their periodical flight, a contracted entrance is highly prejudicial to them. It is an acknowledged fact, that many hives are annually lost from a total negligence or inattention to enlarging or diminishing the entrance of the hive, according to the existing circumstances of the case, or the particular state of the weather. Indeed, the majority of persons are not aware, or they are actually ignorant of the great advantage resulting from a due attention to this apparently trifling point in the management of a bee-hive; but we are certain that a person has only to attend minutely to the state of two hives, one of which has been managed with a due regard to the contraction or enlargement of the entrance, and the other with a total neglect of it, to be thoroughly convinced of the justness of the advice

which is here given. In the fickle climate of England, the temperature of the day in the month of February may be warm and genial, and the following morning may see the earth covered with snow: in this case, the skilful bee-master will lose no time in confining his bees altogether, by letting down the perforated sliders; but how is this to be effected with either mortar or clay? The entrance must be either completely closed, which is highly detrimental to the bees, or so much of it must be left open as to permit the egress of the bees, in which case the death of hundreds will be the consequence.

It is towards the latter end of this month that the dysentery in general shows itself, and the vigilance of the bee-master is now required either to prevent or to cure it. Let them, however, not mistake the excrement of the bee for the dysentery; for there are some bee-masters who are so strongly riveted to the opinion, that the bees void no fæces, that in the spring, when the bees take their periodical flight, and little yellowish globules of a fetid odour are seen on the stool of the hive, as well as on the clothes of the person who stands near it, they immediately declare their hives in an infected state, and would, if possible, place every bee under quarantine. For the best method of preventing or curing this disease, see Chapter XVI.

This is a good season for the purchase of hives; they have surmounted the dangers of winter, and, with the judicious administration of some food, even the weakest hive will prosper.

It is the practice, though a very bad one, of some apiarians to keep their bees confined during the winter; when such has been the case, it is now the proper season to move them into the garden; but let it be understood, that this operation must be performed when the weather is mild and serene; for the bees, feeling the exhilarating influence of the air, will make every exertion to taste the sweets of

liberty, and should the weather not be fine, the death of many will be the consequence.

Should the situation of the apiary not offer the indispensable requisite of water, the bee-master must now take the precautionary step to place troughs or pans of water in the vicinity of the hives. It will, however, sometimes happen, that the water placed on the preceding night will be found, at this season of the year, to be frozen in the morning. This water should be immediately removed, as melted ice is highly injurious to the bees.

MARCH.

Some hives may be found this month to be in a very weak and languid state, which not the most abundant supply of food can exhilarate, nor the utmost skill of the proprietor excite to vigilance and activity. The bees will dwindle away by degrees, until the hive becomes wholly abandoned. This is an infallible sign either of the barrenness of the queen, of the internal disorganization of the hive from disease, or of its being wholly divested of any fecundated eggs of the preceding season. Under such circumstances, the proprietor should immediately proceed to join the bees to the weakest stock-hive in the apiary. *(See Instructions for the junction of hives.)*

In the feeding of the weaker hives, particular care must be taken this month to protect them from the depredations of stranger bees. At this season of the year, the most approved period for feeding is the evening, and early on the following morning to take away the surplus food, of which it is most probable that there will be very little or none; but should such be the case, to restore it to the hives again in the evening. The sense of smell is so acute in the bee, that it immediately scents the food which may be placed in a hive; and should it be a weak one, which the

feeding of it presupposes, an attack upon it by the bees of other hives is generally the consequence.

This month, the tin sliders may be taken away from the entrance, in order that the bees may have the advantage of its full extent; providing at the same time against those casualties, from which the apiary, even under the most skilful management, is never exempt; but in the regulation of which, the prudence and skill of the proprietor must be put to the test accordingly as the circumstances may arise.

This is a good month for the purchase of stock-hives *(see Instructions for the purchase of hives)*, as they have now weathered all the casualties of the winter, and little fear need now be entertained of famine.

The warmer the hives are now kept, the better, as it accelerates the hatching of the eggs, and promotes the prolific nature of the queen.

APRIL.

The active department of the apiary increases this month. In warm and favourable situations, the population of the hive will have increased considerably, and towards the latter end of the month some drones may have made their appearance. This ought to be a matter of congratulation to every bee-master; for immediately that a drone is perceived, the most positive conclusion may be drawn, that the time is not far distant when he will be gratified by the acquisition of a swarm *.

The provident apiarian will now provide himself with the

* Bonner, the celebrated Scottish apiarian, who, if he had had the advantage of the light of education, would have made a most conspicuous figure in the elucidation of the natural history of the bee, always made that day a holiday on which the first drone made its appearance. He immediately collected his family and friends around him, and often, in the plenitude of his enthusiasm, the worthy Scot would, in the language of his illustrious countryman, "toddle right fu'" to his bed, from the effects of his generous metheglin.

new hives required for his approaching swarms. Those intended for the second swarms ought to be one-quarter less in size than those intended for the first. Divest the interior of the hives of all projecting straws, or other objects which impede the labour of the bee.

Considerable robberies take place this month amongst the bees. The utmost vigilance is necessary on the part of the proprietor to discover if any of the hives be attacked: should he find this to be the case, follow the instructions given in Chap. XI.

Keep a vigilant eye on the mother wasp, which at this time makes its appearance in the gardens; the destruction of a single one deprives the bees of a host of enemies.

Should any hive appear to be inactive, fail not to examine it. The cause may be ascertained in time to apply the remedy; but if delayed, the destruction of the hive may be the consequence.

MAY.

This is one of the busiest months in the year for the apiarian. If the bees lie out in clusters, and present the other signs of swarming, let him watch from ten in the morning until three P.M. Artificial swarms may now be made with certainty of success. This is also the season for the transferring of hives, which must be effected immediately after the first swarm has departed.

The apiary must now be kept particularly clean; vermin now abound, and a little attention on the part of the bee-master will save perhaps many of the hives towards the latter part of the year. No danger of famine now exists, but particular attention must be paid to resist the depredations of the different enemies which at this time begin their attack.

JUNE.

In this country swarms may still be expected, and some-

times towards the latter part a virgin swarm may be obtained.

The business of the apiary is chiefly confined during this month to the swarms. The proprietors who still make use of the common straw hive, will do well to add an eke to each of their hives, for the honey season is now fast approaching, and the bees will soon fill the combs.

Persons desirous of establishing an apiary, should purchase the first swarms of this month: if possible, they should be purchased at the distance of one or two miles from the intended apiary. Move them in the evening of the day on which they have swarmed.

If the weather prove rainy on the days subsequently to the hiving of the swarms, omit not to give them a little food, carefully keeping in view the instructions given in the chapter on the feeding of bees. Second swarms should be particularly attended to. No positive instructions can be given for their departure, and therefore the utmost vigilance on the part of the bee-master is required.

JULY.

The honey harvest is now commencing in its full vigour. The swarming season is over, and the attention of the apiarian must now be solely directed to ascertaining if his bees be within the range of an abundant pasture; if not, they should be removed.

The influence of the sun is now great; shade your hives in the midday, especially the swarms, as from the newness of the combs they are very likely to be melted by the heat. More hives are destroyed by heat than cold.

The swarms having departed, this is the proper season for the deprivation of hives, as sufficient time will then be given to the bees to replenish the vacuum. Moderation to be observed in the deprivation.

The deprivated hives to be removed with all possible speed to the vicinity of buck-wheat or heath.

Look for wasps' nests, and destroy them according to the directions, Chapter X.

In this month the virgin swarms are cast; they are, however, so very rare, and in all cases ought to be so particularly prevented, that no instructions for their preservation are necessary. Should, however, one be thrown, join it to a weak second swarm, or return it to the mother hive.

It is generally from this month to October that a hive shows the strongest symptoms of approaching decay. The following are some of the most visible signs. First, when few bees are seen to enter the hive with the load on their legs. Secondly, when at the hour of exercise, which the bees take in fine weather from twelve to three, the bees of any particular hive remain tranquil. Thirdly, when on turning them up to examine them, the bees show not any signs of anger. Fourthly, when ants and other noxious insects are seen to enter the hive without opposition. Fifthly, when the food, which has been given to them, has not been taken up and deposited in the cells. Some of these signs are indicative of the death of the queen, or that the moth has carried its depredations so far as to render the hive untenantable. The proper steps to be taken under these circumstances will be found in the respective chapters.

AUGUST.

The proprietor is now looking forward to his harvest. In this month the bees collect a prodigious quantity of honey.

The middle of this month is not too late to deprive the hives of a part of their superfluous store, provided it be intended to remove them immediately to the vicinity of heath. Be careful to weigh the hives previously to the

operation; do not meddle with a hive that does not weigh thirty pounds.

Determine this month on the hives which are intended to be kept as stocks, and to those hives particular attention must be paid, in order to observe if the necessary signs be shown which indicate a populous and healthy hive.

Towards the close of the month, prepare the utensils necessary for the final deprivation of the hives, and the manipulation of the wax and honey.

The business of the apiarian is this month principally passive; a regular survey of the hives must be taken, and if they be found in an active state of labour, and exhibit other signs of health which have been already described, the less they are disturbed, the better.

SEPTEMBER.

The time is now arrived when all the useless mouths are discarded from the hive; the drones are killed in all well-conditioned hives, and the honey season is drawing to a close.

Remove your stocks to better pasture. The heath is now in bloom. This is a good season for founding an apiary, by purchasing the swarms of the current year. Pay particular attention to those hives which have not killed their drones; some radical defect exists, and if suffered to pass without the application of an immediate remedy, the ruin of the hive may be the result.

Examine well the exterior of your hives; a new covering should now be given them, made of the straw of the present harvest.

If the attack of the wasp be found to be formidable, which frequently occurs in this month, let the entrance to the hives be contracted, or let them be removed to a distant pasture, especially as the heath still continues to be in bloom.

The stools of the hives should be cleaned this month, especially those of the stock hives.

OCTOBER.

The labour of the bee being now closed, those hives should be examined which it is intended to keep as stock hives; they should be first weighed, and having ascertained that there is a sufficiency of food to support them during the winter, clean the stool, and fasten them down for the winter.

The coverings of the hives must be next examined, and should they be found so faulty as to have admitted any rain, the first opportunity must be taken of a fine day to uncover the hive that it may dry. A new covering must then be adapted to the hive, making it completely weather-proof. Wheaten straw is the best material for this purpose. Having contracted the entrance of the hive to about half its original size, the apiarian has now done his duty to his standard hives. The collection of honey takes place this month. To those who suffocate their bees, no instructions are necessary; but to those who deprive their hives, the following precepts will be found useful.

A very great risk is run of totally ruining a hive, if too much honey and wax be taken from them. The principal art in the culture of these insects consists in making a modest use of the right of sharing their provisions; but at the same time to indemnify ourselves for this moderation by the use of all means which tend to the multiplication of the bees. If it be desired to procure annually a certain quantity of honey and wax, it is better to obtain it from a great number of hives which can undergo the process of deprivation with discretion, than from a small number, from which too great a proportion of their treasures might be extracted.

It is absolutely necessary to leave a sufficient quantity for the support of the bees during the winter, and the proportion must be regulated as to the quantity by the apparent population of the hive; for although in proportion to the severity of the winter, the smaller is the quantity of provisions which are used, yet there is always a greater or less consumption, the bees not being in that state of torpor, which is represented by many naturalists.

NOVEMBER.

In this month, the hives must be again visited, in order to ascertain their internal health and weight, and the stools must be cleaned as before. The gradual consumption of the honey of every hive will now be evident, and the difference between the weight of the hive as it stood in October, will enable the proprietor to form a clear estimate, whether the quantity in the hive be sufficient to maintain the bees during the winter. If any late swarms have been preserved, particular attention should now be paid to them, and in open weather it would be advisable to give them a little food.

The entrance of the hive must now be so contracted as to admit of only one bee to come out at a time. This is the season when the field-mouse attempts to lodge itself in the hives, and the covering must be again examined to discover if none have taken shelter under it. As in this month some tempestuous weather may be expected, the precaution must be taken that the hives are firm on their pedestals, and that the straw coverings cannot be deranged by the winds. Should there be a fall of snow during the month, let it be regularly brushed off every morning, or it will penetrate into the hive, and perhaps cause its destruction.

DECEMBER.

The same attention is necessary this month as in the two preceding; but should the cold be intense, no operation whatever should be performed on the hives. The motion attending the examination is apt to disunite the bees, and being attacked by the excessive cold, inevitable death is the consequence. If snow be on the ground, close all the entrances of the hives, and open them not until the snow be thawed. As, however, it sometimes happens, that snow remains a long time on the ground, and the confinement of the bees for such a length of time might prove detrimental to them from a want of fresh air, it would be advisable in the evening sometimes to open the entrances, and close them again in the morning; or a cloudy day might be selected for the renovation of air in the hives, as there is no danger of the bees leaving them, but the bright reflection of the snow is very apt to allure them abroad, when they fall upon it and die. The safest method, however, is to affix the tin entrance to the hive, which entirely prevents the departure of the bees, and at the same time furnishes them with a constant succession of fresh air. In the winter months, a great number of hives are destroyed by the imprudence of the proprietor in allowing the bees free egress from the hives; their flight should be positively prohibited, or only permitted on those days, when the sun shines brightly, and there is no snow on the ground.

The feeding of bees during the cold of December ought to be carefully avoided; the bees consume very little, and grouped together between the combs, they appear almost in a state of torpor; should, however, there be any weak hives in the apiary, select a mild, dry day for the purpose, and be not sparing in the quantity, for it is better to give a suf-

ficiency at one time, than to disturb them often by giving them food in driblets.

Examine the covers : spiders, moths, mice, &c. now shelter themselves under them from the inclemency of the season, and the mice will by degrees perforate the straw, and gain the interior of the hive.

TWENTY-FOURTH CHAPTER.

GENERAL MAXIMS TO BE OBSERVED BY EVERY KEEPER OF BEES.

I.

A hive is composed of three kinds of bees.

1st, The queen, who is the only female, and lays every egg in the hive.

2nd, The drones, amounting in number to from 600 to 1000, according to the population of the hive. They fecundate the eggs of the queen, being the only males in the hive, and are killed by the working bees at the close of the breeding season.

3rd, The common working bees, who, being of the neuter gender, take no share in the procreation of their species. They collect the honey and make the wax, and may be calculated at from 1000 to 6000 in every hive. In summer the numbers are considerably augmented.

II.

The bees never allow of but one queen in a hive, who begins to lay her eggs about the end of January, and finishes about August or September.

III.

The young queens never lay eggs in the parent hive. If there be not a sufficient number of bees to form a swarm, the young queens are killed.

IV.

A swarm without drones is not of any value: when drones are wanting, about two or three hundred to be taken from the parent hive.

V.

A hive which has drones in the winter generally perishes.

VI.

A weak swarm will weigh from one to two pounds; a middling one from three to four pounds; a good one about five pounds, and an excellent one from six to eight pounds.

VII.

Bees deprived of their queen will not work, and will perish if there be no royal egg in the hive from which a queen can be born.

VIII.

The larvæ of the bees are about six days in completing their growth, according to the state of the weather; they then take the form of a nymph or chrysalis, in which they remain about fifteen days, when they emerge from the cell a perfect bee.

IX.

Eggs are hatched successively in a hive; and when the number of bees which have emerged from the cells be greater than the hive can contain, they form what is called a *swarm*, which is always accompanied by a young queen, but never by the mother queen.

X.

There are no determined signs for the departure of a swarm. It generally takes place from the hour of ten A.M., to about two P.M. A swarm seldom departs in windy weather, and never during rain.

XI.

A swarm never to be put in an old hive.

XII.

A hive that has thrown off one swarm will generally throw off a second, and a third; the latter always to be returned to the parent hive.

XIII.

The greater the number of swarms, the less is the quantity of honey.

XIV.

The hives which throw off three swarms generally perish in the winter, unless the swarms be returned to them.

XV.

Swarms do not thrive well in very large hives; the larger the hive, the greater the quantity of wax, and less the quantity of honey.

XVI.

Several swarms united in one hive will furnish a greater supply of honey than if allowed to remain separate.

XVII.

The first occupation of a swarm is to construct the combs, and scarcely twenty cells are made before the queen begins to lay her eggs. All the combs are generally placed in a direction perpendicular to the entrance of the hive. The interval between each comb is about three lines.

XVIII.

There are only three substances in a hive. 1st, Honey, which is collected from the flowers. 2nd, Wax, formed by an elaboration of the farina of plants. 3rd, Bee-bread, which is the crude farina of plants not yet elaborated.

XIX.

The cells of the combs are of different dimensions. The cells in which the common bees are bred are a complete hexagon, and the smallest in size. The cells in which the drones are bred are larger, and irregular in their shape. The cells in which the queens are bred are placed perpendicularly on the edges of the combs, having the opening at the bottom, and about the size of an acorn.

XX.

The bees never to be allowed to leave the hive during the time that snow is upon the ground.

XXI.

The cells which contain honey are covered with a small pellicle, and are flat; the cells which contain brood are convex.

XXII.

The severer the cold, the less is the consumption of food; if kept dry, there is not any cold in this climate which can affect the lives of the bees.

XXIII.

The hives which are completely closed during the winter become foul and musty, which occasions the death of the bees, independently of their being prevented taking their periodical flight for the purpose of venting their fæces.

XXIV.

The mortality of bees proceeds almost always from the want of provisions, or the death of the queen.

XXV.

The aspect of an apiary should always be to the south-east. A hive with an aspect towards the north will not swarm so soon by three weeks as one which has an aspect towards the south.

XXVI.

Water is indispensable to bees; if not naturally in the immediate vicinity of the hives, to be artificially supplied.

XXVII.

Raw sugar never to be given to bees as food; and no food to be given to bees which has not undergone the process of boiling, with the exception of honey itself.

XXVIII.

Neither tobacco nor sulphur to be used in the fumigation of bees; the smoke of dried leaves or rags will answer every purpose.

XXIX.

Every hive to stand upon its own pedestal, two feet from the ground. Hives placed on benches are subject to pillage and battles.

XXX.

A person may by law follow his swarm into the garden of another person, paying for all damage that he may occasion, provided he can prove that he has never lost sight of the swarm from its departure from the hive.

XXXI.

The customary noise with pokers and shovels, and frying-pans and warming-pans, is of no real benefit. The bees will never settle until the queen sets them the example.

XXXII.

Deprivation of hives to take place in the spring, and not in the autumn. Glasses to be placed on hives in the month of February or March. Hives seldom swarm which have glasses put over them.

XXXIII.

Hives to be protected from the sun in summer when the heat is very great. In spring, however, the coverings to be

taken off the hives, that the sun may play fully upon them. A hive without a covering will swarm a fortnight sooner than one with a covering.

XXXIV.

Bees to be assisted in the killing of the drones. As not a single drone is left in the hive, they may be indiscriminately killed as soon as the bees signify the proper time.

XXXV.

Bees of a first swarm begin their combs in the middle of the hive; the bees of a second swarm begin their combs at the side. A valuable hint to the purchasers of swarms.

XXXVI.

Swarms always to be fed if rainy weather ensue immediately after their being hived. The food to be given late at night, but *never* in the middle of the day. A swarm not to be placed in the immediate vicinity of the parent hive.

XXXVII.

In winter, the bees occupy the top of the hive; in spring and summer they occupy the middle and the bottom.

XXXVIII.

The age of a hive determined by the colour of the combs. The combs of a young hive are yellow, progressing through every shade to a positive black, which is an indisputable sign of an old hive.

XXXIX.

The goodness of a hive determined by its weight; a hive of twenty-five pounds may be considered excellent if in the months of February or March; if in September or October, it is then but of a secondary character.

TWENTY-FIFTH CHAPTER.

A COMPARATIVE EXHIBIT OF THE SYSTEMS OF HUBER AND HUISH.

HUBER.	HUISH.
1.	1.
A hive is composed of *eight* kinds of bees.	A hive is composed of *three* kinds of bees.
I.	I.
The queen, who lays certain kinds of eggs.	The queen, who lays every egg in the hive, and is in fact the only female in it.
II.	II.
The drones, one of which is sufficient to fecundate a queen during the whole of her life.	The drones, who are the males, and who fecundate the eggs of the queen as they are laid in the cells.
III.	III.
The common bees, who are females, having ovaria, and laying eggs, from which males only spring; which males, however, are never seen.	The common bees, who collect the honey and make the wax, and are of the neuter gender.
IV.	
Wax-makers, from whose body the wax exudes.	

HUBER.	HUISH.
V. Wax-workers, who make no wax, but who nevertheless construct the cells.	
VI. Royal jelly makers, who fabricate an extraordinary liquid, wherewith a queen is generated whenever one is wanted.	
VII. Nurse-bees, whose office it is to attend upon the brood.	
VIII. Black bees, who are born only to be starved to death.	
2. The bees sometimes allow *two* queens in a hive, a *big* one and a *little* one; the latter only laying the eggs of males—allowed by Kirby, and acquiesced in by Rennie.	2. The bees never allow but *one* queen in a hive.
3. The queen oviposits at all seasons of the year, and even in winter.	3. The queen oviposits only in the spring and summer, and *never* in the winter.
4. It is the mother queen who departs with the first swarm.	4. It is the *young queen* who departs with the first swarm.
5. The queen is fecundated	5. The queen is not fecun-

HUBER.	HUISH.
by an act of coition with the drone in the open air, who loses his genital organ on the occasion, and dies.	dated by any act of coition with the drone.
6.	6.
A swarm is not accompanied by any drones.	A swarm has never less than two or three hundred drones.
7.	7.
Drones are frequently bred in a hive during winter.	Drones are never bred, nor known to exist in a hive during the winter.
8.	8.
The maximum of young queens born in a hive in one season is twenty-seven.	The maximum of young queens born in a hive in one season is seven.
9.	9.
The bees in search of food travel half a mile.	The bees in search of food travel five or six miles.
10.	10.
The supernumerary queens are killed by each other in single combat.	The supernumerary queens are destroyed by the common bees.
11.	11.
Hives will throw seven or eight swarms, and yet survive the winter.	Hives which throw off three or more swarms, generally perish in the winter. No hive was ever yet known to throw seven swarms. The greater the number of swarms, the less the quantity of honey.

HUBER.	HUISH.
12.	12.
Food of various kinds is administered to the worms, according to their ages.	No kind of food is administered to the worms in the cells.
13.	13.
Wax is made from honey or sugar, imbibed by the bees called wax-workers, from whose bodies it exudes in scales between the rings of the abdomen.	Wax is made from an elaboration of the pollen of flowers in the second stomach of the bee.
14.	14.
Propolis is a vegetable substance collected by the bees, and has no affinity whatever with wax.	There is no such substance in a hive as propolis. The substance called propolis is an accumulated mass of wax in a rough state of elaboration.
15.	15.
The cells of the bees are made of wax, and lined and soldered with propolis.	The cells of the bees are entirely made of wax, without the admixture of any other substance.
16.	16.
The bees kill the drones by means of their stings.	The bees never make use of their stings in the massacre of the drones.
17.	17.
The queen makes use of her sting in the killing of the young queens in their cells.	The queen never makes use of her sting on any occasion whatever.
18.	18.
The first-born queen stings	The first-born queen never

HUBER.	HUISH.
the young queens to death in their cells.	stings to death any of the young queens.
19.	19.
The farina, when deposited in the cell, is mixed and kneaded with honey.	The farina is deposited in the cells in the crude state that it is collected by the bees.
20.	20.
The bee, in unloading itself, goes head-foremost into the cell.	The bee, in unloading itself, places its hinder feet in the cell, but never its head.
21.	21.
If the impregnation of the queen has been retarded, she makes the greatest mistakes; laying drone eggs in common cells, and common eggs in drone cells.	The queen is always conscious of the kind of egg which she is about to lay; never laying a drone egg in a common cell, nor a common egg in a drone cell.
22.	22.
A young queen cannot lay the eggs of drones until she be *eleven months old.*	A young queen lays the eggs of drones immediately on being domiciled in a hive.
23.	23.
The hive which has lost its queen can rear another from a common egg, selected for that purpose, by the administration of royal jelly.	The hive which has lost its queen, cannot rear another unless there be a royal egg in the hive.
24.	24.
Bee-bread is used as the food of the larvæ, administered by the common bees.	Bee-bread is not applied to the nutriment of the bees, nor as the food of the larvæ.

HUBER.	HUISH.
25.	25.
There are six substances made by the bees in a hive, viz. honey, propolis, wax, bee-bread, royal jelly, and cream.	There are three substances made and collected by the bees in a hive, viz. honey, wax, and pollen, or bee-bread.
26.	26.
The queen possesses the power of emitting a clacking noise when confined in her cell, and also when she wishes to strike the bees motionless.	The queen-bee has not the power of emitting any sound whatever.
27.	27.
The bees have the power of imparting to their combs whatever colour they please.	The bees do not possess the power of imparting any particular colour to their combs, which are originally white, then yellow, through all its shades, then black, being the direct effect of the internal heat of the hive.
28.	28.
The bees are endowed with the skill of erecting fortifications and other structures, as means of defence against their enemies.	The bees, in the construction of their combs, adhere to one form and figure, and in no instance do they erect any structure or means of defence.
29.	29.
The cells which contain honey are filled at the top with a kind of cream.	The cells which contain honey are covered with a thin pellicle of wax, and are concave. The cells which

HUBER.	HUISH.
	contain the brood are covered with the same kind of pellicle, and are convex.
30. Bees can be made to augment at pleasure the temperature of a hive by shaking them well, by which they emit as much heat as will warm an apartment or a green-house.	30. Bees do not possess the power of augmenting the heat of their hive, nor can they be forced to it under any circumstances whatever.
31. The common bees keep a guard over the cells of the young queens, to prevent them making their escape.	31. The common bees establish no guard over the queen cells, nor prevent the departure of the queens at the regular time.
32. The queen-bee feels an instinctive horror at the sight of a royal cell.	32. The queen-bee pays no attention whatever to the royal cells.
33. A hive may be kept *one hundred* years without any alteration in it.	33. A hive is not worth keeping after the fifth year, the combs being then almost useless both for honey and brood.
34. The cells which contain honey are covered with a *white* pellicle; those which contain brood are covered with a *brown* pellicle.	34. The cells which contain honey, and those which contain brood, are covered with the same substance, which is wax.

HUBER.	HUISH.
35.	35.
It is in the upper part of the combs that the bees deposit their honey, their brood in the middle, and *the wax at the bottom.*	The bees deposit their honey in the side combs, and as to the wax being at the bottom, the entire structure of the combs is wax, which abounds more at the top of the hive than the bottom.
36.	36.
The bees can alter the generic character of the eggs after being laid by the queen.	The bees cannot alter the generic character of the eggs under any circumstances whatever.
37.	37.
The bees construct their combs in all directions, and in some instances at a right angle with the entrance.	The bees work their combs *always* parallel with the entrance.

THE END.

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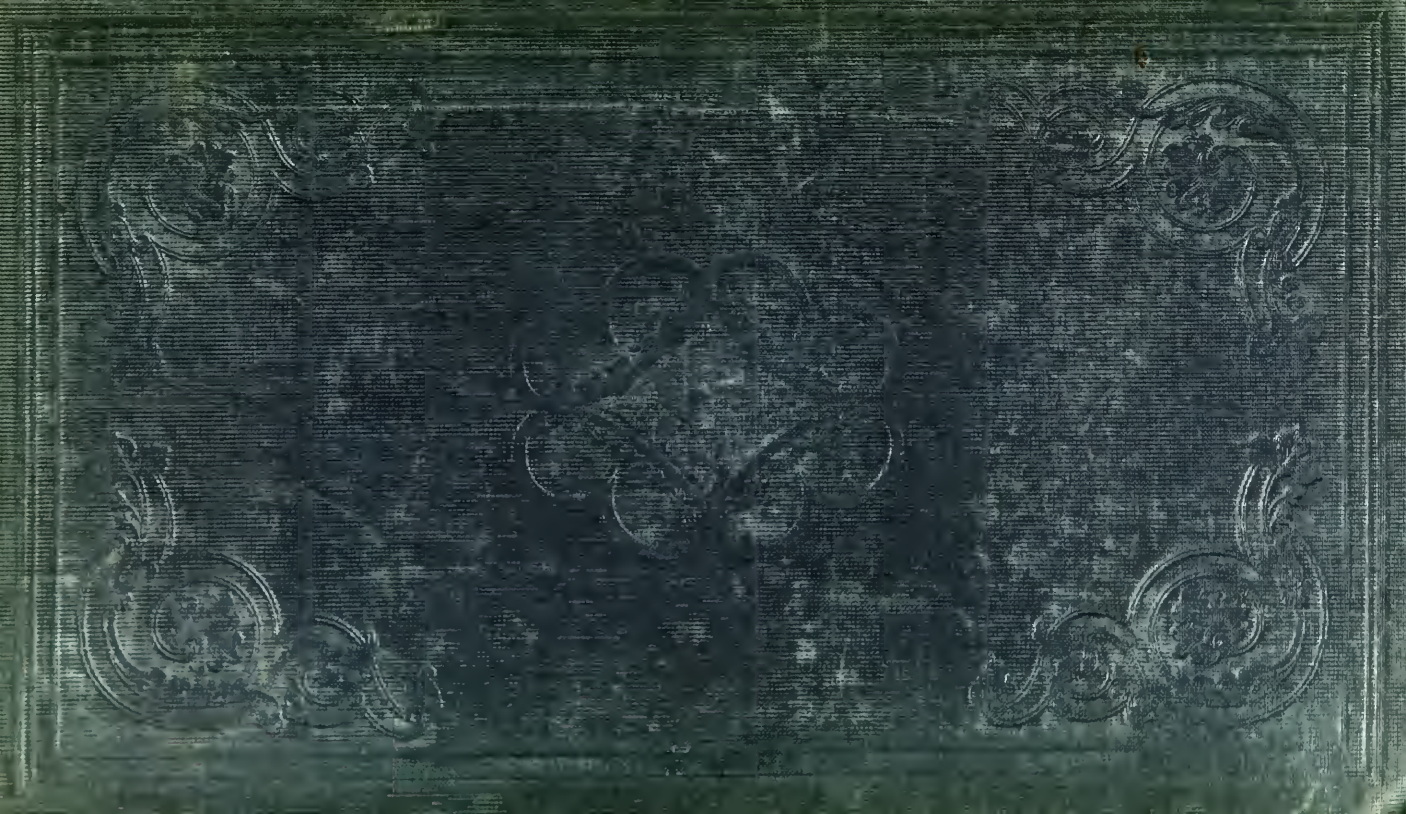
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